

DO-IT-YOURSELF HARD DRIVES

Programming the Amiga in Assembler Implementing an ARexx Interface in C Programming the Amiga's GUI in C—Part IV CAD Application Design—Part III Low-Level Disk Access Designing a Ray Tracer—Part II AudioProbe in Modula-2 Writing MusicX Protocols





HINK ALL '040 Accelerators are the same?

As a high power Amiga® 3000/3000T user you need a 68040 accelerator board for one reason ... and one reason only ... SPEED!

THINK AGAIN!

And once you know what makes one 68040 accelerator better than another, the only board you'll want is the G-FORCE 040 from GVP

WATCH OUT FOR SLOW DRAM BOTTLENECKS

Yes, all 66040 CPU's are created equal but this doesn't mean that all accelerator hoards allow your A3000 to make the most of the 68040 CPU's incredible performance.

The A3000 was designed to work with low cost, 80ns DRAM (memory) technology. As a result, anytime the '040 CPU accesses the A3000 motherboard, memory lots of CPU wait-states are introduced and all the reasons you bought your accelerator literally come to a screeching halt!

Not true for the G-FORCE 040 ..

SOLUTION: THE G-FORCE 040'S FAST, 40ns, on board dram

To eliminate this memory access bottleneck, we designed a special 1MB, 32-bit wide, non-multiplexed, SIMM module using 40ns DRAMs (yes, *forty nanoseconds!*). This revolutionary memory module allows the **G-FORCE 040** to be populated with up to 8MB of state-of-theart, high performance, on-board DRAM. Think of this as a giant 8MB cache which lets the '040 CPU race along at the top performance speeds you paid for.

SHOP SMART: COMPARE THESE G-FORCE 040 SPECS TO ANY OTHER '040 ACCELERATOR

68040 CPU running at 28Mhz providing 22 MIPS and 3.75 MPLOPS! NOTE: The 68040 incorporates a CPUT, MMU_FPU and separate 4KB data and instruction caches on a single chip. ▶ 0 to 8MB of onboard, 40ns, non-multiplexed, DRAM. Fully auto-configured, user-installable SIMM modules lets you expand your A3000 to 24MB!

 DRAM controller design fully supports the 68040 CPU's burst memory access mode.

 Full DMA (Direct Memory Access) to/from the on-board DRAM by any A3000 peripheral (e.g. the A3000's builtin hard disk controller).

Asynchronous design allows the 68040 to run at clock speeds independent of the A3000 motherboard speed. Allows easy upgrade to 33Mhz 68040 (over 25.3 MIPS!) when available from Motorola.

 Hardware support for allowing V2.0 Kickstart ROM to be copied into and mutored by the high performance onboard DRAM. Its like caching the entire operating system!

 Software switchable 68030 "fallback" mode for full backward compatibility with the A3000's native 68030 CPU

 Incorporates GVP's proven quality, experience and leadership in Amiga accelerator products.

TRY A RAM DISK PERFORMANCE TEST AND SEE FOR YOURSELF HOW THE G-FORCE 040 OUT PERFORMS THE COMPETITION

Ask your dealer to run any "RAM disk" performance test and see the G-FORCE 040's amazing powers in action.

So now that you know the facts, order your G-FORCE 040 today. After all, the only reason why you need an '040 accelerator is SPEED!

G-FORCE



Up to 8MB of high speed (40ns) DRAM Motorola 68040 CPU running at 28 Mhz

A3000 "CPU slot" connector



GREAT VALLEY PRODUCTS INC. 600 Clark Avenue, King ul Prussia, PA 19406

For more information or your nearest GVP dealer, call today. Dealer inquiries welcome. Tel. (215) 337-8770 • FAX (215) 337-9922

G.F. mai 646 in a sugnal individual of Green Valley Products inc. Amage is a significant maternant of Connected on Arrigation 2:1991 Chean Valley Products Inc.

AC' TECH AMIGA

Contents

Volume 2, Number 1

4	Spartan—Build Your Own SCSI Interface
	For Your Amiga 500/1000 by Paul Harker
	Stop swapping disks! Step up productivity inexpensively by building
	this complete SCSI hard drive project (includes software on disk!).
13	CAD Application Design-Part III on Encost W. Amald
	Develop an architecture for implementing geometry objects as the object.
	oriented objects—using plain ANSI C and some programming magic.
27	Implementing on A Davy Interface
21	In Your C Dreamer Anexx Interface
	In Your C Program by David Blackwell
	application written in C.
41	The Amiga and the
41	MDI Hardware Creetfaction
	wiDi Hardware Specification by James Cook
	own MIDI hardware Interface/
45	Programming the Amige is 690+0 Assembles
40	Programming the Arniga in booxto Assembler
	Fart I by William P. Nee
	assembler on disk!
53	Programming the Amiga's GUL in C
50	Pogramming the Aninga's Gor In C
	-Part IV by Paul Castonguay
	The popular programming luturial continues with laster and advanced draw routines!
65	Programming a Ray Tracer in C-Part II by Bruno Costa
	The practical usage of the illumination model theory, with many commented examples from
	the ray ray-tracer (on disk)
71	Low-Level Disk Access In Assembly by Dan Babcock
	Develop an easy-to-use set of routines for performing floppy access
	without the aid of the operating system.
79	Writing Protocols for MusicX by Daniel Barrett
	A step-by-step approach to writing protocols to get that MIDI synthesizer to work with MusicX.
86	AudioProbe-
	Experiments in Synthesized Sound with Medule 2
	Explore the application of analog synthesizer concepts to Amiga sound generation.
Depa	rtments

- 3 Editorial
- 49 Source and Executables ON DISK!
- 64 List of Advertisers

printf("Hello");

print "Hello"

JSR printMsg

say "Hello"

writeln("Hello")

Whatever language you speak, AC's TECH provides a platform for both gaining insight and sharing information on its most innovative implementation for the Amiga. Why not see if your latest programming endeavor can help a fellow Amiga user expand upon his or her vocabulary? To be considered for publication in AC's TECH. submit your technically oriented article (both hard copy & disk) to:

AC's TECH Submissions PiM Publications, Inc. One Gurrant Place Fall River, MA 02722

AC' TECH AMIGA

ADMINISTRATION

Publisher Assistant Publisher: Circulation Manager: Asat. Circulation: Corporate Trainer: Traffic Manager: International Coordinator: Donna Vivnims Marketing Manager: Programming Artist:

Joyce Hicks Robert J Hicks Dores Gamble Traci Destnarais Virginia Terry Hicks Robert Gamble Emest P. Viveiros Sr E. Paul

EDITORIAL

Managing Editor: Technical Coordinator: Ernest P. Viveiros. Jr. Associate Editor: Hardware Editor: Technical Editor: Copy Editors:

Video Consultant: Art Director:

Photographer:

Illustrator:

Don Hicks Joff Gamble Ernest P. Viueine Sr. J Michael Morrison Timmothy Duarte Faul Lamvee Frank McMahon Rick Hess Paul Michael Brian Fox Production Assistant: Valerie Gamble

ADVERTISING SALES

Advertising Manager: Donna Marie Advertising Associate: Wayne Amuda

> 1-508-578-4200 1-800-345-3360 FAX 1-508-675-6002

SPECIAL THANKS TO: Richard Ward & RESCO

AC & TECH For The Commodure Amigate (ISSN 1951-7 9 7 9 is published quarterly by FMA Publications, Inc., One Current Road, P.O. Box 859 Fail River, MA 52722-0659

Subscriptions in the U.S., 4 issues for \$ 47. 95 in Canada & Mexico Surface \$5.1.55 foreign nurface for\$55.95

Application to mail al Second Glass postage rates pending at Fail River MA 02722

POSTMASTER Sund address changes to PIM Publications Inc. F.O. Box 869, Fail River, MA 12722,0869, Printed in Inc. U.S.A. Copyrights 1991, 1992 by FiM Publications. Inc. An experience integration

First Class of Air Mail tates available upon request. P.M. Pablications inc. maintains the right to refuse any edve this ind

PLM Publications top in hot obligated to retern unstructed marenals. All requested returns must be received with a Sett. Add) ensield Stamped Marler

Send article submissions in both menuporto) and disk format with your nemal address, telephone, and Social Security Number on each to the Editor, Requests for Authoric Guides should be directed to the address listed above

AMIGATO'S STREAMENT ITALITATION OF Commodels Amigit Ind

Startup-Sequence

It's Official-AmigaDOS 2.04!

Move over AmigaDOS 1.3...AmigaDOS 2.04 is officially here! The OS code has been frozen. The final release version of AmigaDOS release 2 is 2.04 with Kickstart v37.175, and Workbench v37.67. These are the OS versions that are being put into ROM in the new machines and the Enhancer Kit (upgrade for the A500/2000).

Easy Upgrades

Upgrading Amiga 500s and 2000s will be accomplished via the 2.04 Enhancer Kit, which will be available through the authorized dealer channel. This will be a ROM and software upgrade. Once the new 2.04 ROMs are in, say goodbye to AmigaDOS 1.3, forever. However, there are several third parties that are developing, or have developed ROM Towers (switches) for the A500/ 2000. These ROM Towers hold both 1.3 and 2.04 KickStart ROMs and allow selection of the boot ROM via an externally mounted switch. Add a little intelligence to your startup sequence, and prestol Dual personality! Any side effects? Hmmm... It's too early to say, but there is at least one potential problem: AmigaDOS 1.3 does not recognize AmigaDOS 2.04 hard links. These will look like empty files under 1.3. If anything, these will cause a little (or lots) of confusion. Just be cautious.

A3000-1 Want My ROM

What about an upgrade for the original Amiga 3000 with the SuperKickstart? Sources at Commodore say that a free 2.04 upgrade will be made available through the dealer channel. This will be a five disk software upgrade (3000 Install, Workbench, Extras, AmigaFonts, and KickStart.) Dealers are authorized to charge a nominal copying fee for the disks. Will there be a 2.04 ROM upgrade/system trade-in for the SuperKickstart Amiga 3000s? At press time the details are unspecified, but there is a plan on the table. Ask you dealer for more specific information.

What about running AmigaDOS 1.3 on an A3000 with 2.04 in ROM? You can't...right now. The A3000 uses two 256K ROMs as opposed to a single 512K ROM on the A500/2000. It's this reason, plus a hundred other engineering and legal reasons, that you won't see an A3000 ROM Tower switch. However, I'm sure that some bright entrepreneur/developer will come up with a way (i.e. marketable product) to boot AmigaDOS 1.3 on an A3000 with 2.04 in ROM. What's your best bet on upgrading a SuperKickstart A3000 to AmigaDOS 2.04? If you *have* to run AmigaDOS 1.3, then stay with a software upgrade—at least until there is another way to run 1.3 on a 2.04 machine. If you are a developer, then its probably a good idea to stay with the SuperKickstart so you can continue to easily get and install system software upgrades. Go with the hardware upgrade if you need to use a 68040 CPU in your A3000. The new ROMs fixed cache bugs and added OS cache calls. Also, it is rumored that some SCSI devices do not like to see the old 1.4B5 ROMs. In these cases, the 2.04 ROM are required. Take your pick.

Finally, starting with AmigaDOS 2.04, all new A3000s will come with AmigaDOS 2.04 in ROM

Looking to the future ...

Next step AmigaStep?

One of the better applications bundled with the powerful UNIX-based NeXT[™] workstations is its extremely powerful application-builder NeXTStep[™] NeXTStep is an extremely intuitive, easy-to-use, yet incredibly powerful GUI/application builder, which puts the power of real programming into the hands of the power user. NeXTStep is not an everyman's solution to programming, but it does open up programming to the advanced user, who has the mindset to program, but can't get over the complexities of programming the GUI at the medium-to-low level. NexTStep can also be used in a lower-level capacity to develop commercial-quality software.

Rumor has it that Commodore is actively working on an application builder that will be NeXTStep and more! This versatile and powerful application builder will be able to handle all aspects of the Amiga GUI, ARexx, IDCMP, font sensitivity, and more. When can we expect to see this programming marvel? No one's talking, but a good guess says that they'll have it in beta sometime during the first quarter of '92. I can hardly wait...

Ernest P. Viveiros, Ir.

Technical Coordinator



Build A SCSI Interface for Your Amiga 500/1000

by Paul Harker

CAUTION: Becare ful when attempting to build and connect hard ware projects to your computer. Always clirch your work tunce before all a hing the project to your computer Attacking a home-built project to your Amiga may cold its learning PuM Publications. his its agents, or the author, is not responsible for any resulting damages from this project. As always, use care and common sense

If you are like many Amiga users, you spend entirely too much time swapping disks and get bored waiting for your iconsto display and your programs to load. Perhaps it is time to add a hard drive. The first step in adding a hard drive is the interface. between the computer and the drive. For the Amiga, the defactoslandard is SCSI (Small Computer System Interface). Spartan is a build-it-yourself SCSI hard drive interface for the Amiga 500 and 1000. Using CPU (non-DMA) data transfers. Spartan is capable of data transfer rates of well over 300K per second-more than adequate for the average Amiga user Spartan is 100% compatible with all Amiga software, including popular hard drive utilities such as Quarterback.

Spartan supports all standard SCSI hard drives, removable media SCSI drives such as the 5vQuest, and even the old IBM type ST-506/412 drives (see Adaptec Sidebar). Drives can be assigned to seven different SCSI addresses, and up to fourteen hard drives can be controlled.

Physically, the Spartan SCSI interface consists of a small circuit board connected to the expansion bus of the Amiga. Using the powerful AM5380 SCSI control IC, two standard TTL chips, and a few capacitors and resistors, the interface gives your Amiga the ability to communicate with standard SCSI drives. The interface address in memory is selectable to avoid conflict with expansion memory or other add-on hardware. To remain inexpensive and to keep the circuit simple, the Spartan interface does not support autoconfiguration or autobooting.

The Sparton device driver is a bny 2048-byte file which is loaded via the MOUNT command, and a properly edited mountlist. Low-level format routines are provided for SCSI drives. and for Adaptec controllers. Also included is the 'C' source code the the low-level format routines to allow modification for support of non-standard SCSI drives, or control of other types of SCSI devices.

Addressing

The Spartan interface is what is known as a memory mapped device. This deviates from the AutoConfig method utilized by many devices on the Amiga. AutoConfig looks for an unused area in memory, and then assigns that address to the hardware. Due to the simplicity of the Spartan circuit design, we must do the job. of locating a safe area in memory ourselves. As Spartan decodes memory in 64K blocks, the safe area to which the interface is addressed will be refered to by it's "base address." The base address is the high byte of the actual address. As an example, if the address is 2FFFFF, then the base address is 2F.

There are two areas in the Arniga's memory map which are good candidates for locating Spartan. First, the area from F00000 to F80000 is unused by the Amiga operating system and makes F7 (address F70000) a perfect base address for your interface. However, if you have an Amiga 500 expansion memory cartridge such as AdRam 540 or similar units with more than 500K of expansion, you may not be able to use this address. This is because they remap this area for expansion RAM. The normal one half MB A501 or A501 clone expansions will NOT interfere with this address. If you are in doubt, refer the the documentation that came with your expansion as to where it installs memory

If you are unable to locate your interface at base address F7, then you must locate it between 200000 and 8FFFFF. This area is normally used for expansion memory, however, unless you have a full 8MB, there will be room to address the interface. The documentation which came with your memory expansion should allow you to locate an unused area within this range. For example, if your expansion memory is:

Start		End
200000	10	27FFF
400000	to	47FFF
8000008	10	B7FFF

then a base address from 28 to 3F and from 48 to 7F would be valid.

Regardless of whether your base address is F7 or elsewhere in the memory map, note the address, as it will be used in configuring both your hardware and software.

Building the Interface

By far the easiest and most reliable method of building the interface is to obtain the etched and drilled circuit board available from the author. If you wish to etch your own board, the pattern is provided in Figure 1. If you wish to build using another method of construction, see Figure 2 for the schematic. A carefully built wire wrapped circuit should have no problems if you keep wire lengths to a reasonable minimum. The following assembly discussion refers to the etched circuit board, but should be helpful for any type construction.

Refering to the placement guide (Figure 3) note that all parts on the interface are inserted from the component side of the board. That is, the side WITHOUT the copper traces. Insert and carefully solder the three IC sockets in place. If you examine the sockets, you will notice one end has a small notch. Be sure this notch is at the pin 1 end as indicated in Figure 3.

Insert and solder the resistor packs (RP1, RP2, RP3, RP4) as indicated, again paying attention to the orientation of pin 1. Pin 1 is indicated by a stripe or dot on the part. Insert and solder C1, C2, and C3 as indicated, and clip the leads neatly. Note the polarity of C4 on Figure 3. The capacitor itself has one lead marked + on the side of the capacitor. Insure that this lead is inserted as indicated. Solder and clip the leads

Install nine jumpers as indicated using either your left over capacitor leads, or small lengths of wire. Solder and neatly trim the jumpers. Next, insert and solder the 50-pin SCSI connector.

The 86-pin connector to the Amiga poses a bit of a problem. For simplicity of design, the board is constructed so that the connector slot is parallel to the board. Normally this requires an 86 pin right angle connector. That is, the pins exiting from the back of the connector make a right angle turn. However these connectors are not available in small quantities. If you are lucky enough to locate one, simply solder it in place. Otherwise you can modify the connector listed on the parts list to do the job nicely. Refering to Figure 4, carefully bend one row of pins on the connecter at a right angle. Insert this bent row of pins into the row of holes CLOSEST to the edge of the board. You may wish to put a drop or two of super glue to fix the connector in place on the board. Once in place, solder the row of pins. Now, using short lenghts of wire, such as resistor leads, connect the remaining pins of the connector the the corresponding hole as shown in the drawing. Solder in place both at the pin, and on the circuit board.

Install the dip switch as indicated. The dip switches are for setting the base address of your interface. Retering to Figure 5, you can see that each switch refers to a bit in the base address. A closed switch is a 0, and an open switch is a 1. Several example settings are shown. Just note that the high bit is the switch closest to the SCSI connector and the low bit is the switch closest to the Amiga connector. Set the switches to agree with your base address.

Check your parts placement, and soldering. Insure that you have no solder "bridges". All it takes is one 'OOPS' and you could damage your interface or computer. Once you are done checking your work, have someone else double check it for you. If all checks OK, proceed with inserting the IC's.

NOTE: IC's are STATIC SENSITIVE. Use proper measures to prevent damage. If you are unsure of how to do this, please have someone who is, insert your IC's for you.



Figure One The Spartan PCB Layout





Insert the three IC's in their respective sockets, insuring that pin one is correctly positioned. The pin one end can be identified by either a notch at the end, or a dot next to pin one. This pin one should be at the pin one end of the socket. This completes the assembly of your Spartan interface!

Assembling the SCSI System

In addition to the Spartan interface and software you will require the following:

SCSI Hard Drive (or Adaptec 40X0/ST506-412 combination) 50-Pin SCSI Cable

IBM PC/XT type power supply Power cable for power supply Enclosure for drive and power supply

An IBM 'clone' case will accept both the power supply and the hard drives nicely, and are available inexpensively from many sources. While powering a small hard drive directly off the power supply of the Amiga 1000 is possible. I don't recommend it and it is absolutely prohibited with the minimal power supply of the 500.

Figure Three PCB Component Placement





Mount your drive and power supply in your enclosure, insuring that the circuitry does not short to the case or to another component. Layout is not important. Flug a power connector from your power supply into the power socket on the hard drive. Set the SCSI address of your drive to 0 as directed by the owners manual. Ensure that the Amiga is turned off and connect the assembled Spartan interface to the expansion bus. On the 500, simply remove the snap on cover from the left end, and firmly push the interface in place (components facing up if using the etched board). On the 1000, the interface installs on the right side of the computer (once again, component side up).

At this time, take a deep breath, and power up your Amiga. If it does not boot up properly, IMMEDIATELY turn the power off and recheck all your work. If you continue to have problems, see the section on PROBLEMS.

Turn off your Amiga. Install the 50 pin SCSI cable between the interface and your hard drive. Insure that pin 1 of the cable is at the pin 1 end of the connectors at both ends. Recheck all connections. Once you are sure your cabling is correct, proceed with formatting.

Formatting

Hard drives require two forms of formatting, the low-level (physical) format, and the high-level (logical) format. The highlevel format is what you are already familiar with. That is, it is the type of format you perform when using the 'Format' command from AmigaDOS or 'Initialize' from the Workbench. The lowlevel format, which is only used on hard drives, marks bad sectors of the drive as unusable, sets the interleave (more on this later) and stores important information about the configuration.

A set of low-level format utilities. AFormat, for Adaptec controller/ST506 drive combinations, and SFormat, for standard SCSI drives, are included on disk. These are executed from the CUIby typing 'AFormat' or 'SFormat' at the DOS prompt. You are then presented with a series of questions about your particular configuration. Once these are answered, it then performs a complete low-level format of your drive. These programs tie up the SCSI bus completely, so do not attempt any other SCSI access while performing a low-level format, or you will meet the GURU.

To perform the low-level format, first boot your Amiga, and open a CLI. Turn on the power supply to the hard drive. The hard drive will go through some initialization activity. This may be indicated by the flashing of the led on the drive and controller. Once this activity is finished, run the low-level format utility for your drive. You will be prompted for information regarding your particular configuration. AFormat requires much more information than does SFormat. You need to know several things about your hard drive to perform a low-level format. This information should have been included with the drive. A text file on disk, 'DriveSpecs', gives the needed information for many popular hard drives. If you can't find information for your drive, contact the drive manufacturer.

AFormat will prompt you for:

Base address Adaptec Card Type SCSI Address Drive II

Number of Cylinders Number of Heads Step rate Interleave Reduced Write Current Enter Cylinder # Base address in HEX Enter 1 for the 4000(A), 2 for the 4070. Enter the drives address Drive 0 connects to J0 and Drive 1 connects to J1 (refer to the Adaptec Manual). Enter the number of cylinders. Enter the number of heads Enter the step rate of your drive. Enter the step rate of your drive. Enter 'Y' or 'N' Enter the starting cylinder number for Reduced Write Current. AFormat will then prompt for information regarding media errors on your hard drive. This information is normally noted on a label attached to the drive. Enter this information as requested. To terminate error entry, enter a 0 (zero) at the 'Cylinder.' prompt.

SFormat is much simpler to use and only prompts for base address, SCSI address, and the interleave

Base address	Base address in HEX
SCSI Address	Enter the drives address.
Interleave	Enter 2

Following data entry, you will be given a last chance to bail out. If you continue, the drive will become active for about 5 minutes. (20MB drive, correspondingly longer on larger drives)

If you have an non-standard SCSI hard drive which will not format with SFormat, it will work with your Spartan interface if it has been low-level formatted. The drive can be formatted on another computer as long as the bytes-per-block is 512, in fact most SCSI drives are sold with a 512 byte-per-block low level format already on them. The Macintosh and Amiga both use this block size, so you can format your drive (low-level) on another computer, then hook it up to your Amiga to perform the DOS format.

For those with C language experience, the source code for SFormat is included on disk. This can be easily modified to conform to the low level format command sets used by nonstandard SCSI drives. This source is compileable by Aztec C.

Make a copy of your AmigaDOS 1.3 Workbench. This will be refered to as your boot disk. The copy of spartan device on disk is addressed to base address F7. If your Spartan interface is at base address F7, simply copy spartan device from the DEVICE directory into the devs: directory of your boot disk. However, if you have a base address other than F7, you must use the supplied utilty. SetBase, to modify the base address of spartan device.

The usage of SetBase is:

SetBase <filename> <BaseAddress>

Filename will normally be 'spartan.device' (including the path), and BaseAddress is the two character hex base address of your interface. SetBase will create a new file named '<filename>.XX' where XX is the base address of the driver. Copy this new device to the DEVS: directory of your boot disk and rename it spartan.device.

Edit your mountlist to include the following (modified to your configuration). Please note that unlike most AmigaDOS commands, the MOUNT command is case sensitive. Be sure that the device file name and mountlist device entry match exactly. DHO:

```
Device = spartan.device
Unit = 0
Flags = 0
Surfaces = 4
```

BlocksPerTrack = 17 Reserved = 2 LowCyl = 0 ; HighCyl = 614

Buffers = 30

BufMemType = 0

MaxTransfer = 131071	
Stacksize = 4000	
GlobVec = -1	
FileSystem = L FastFileSystem	
DosType = 0x444f5301	

not used Number of heads on drive See Text Don't change Bottom and top cylinder numbers; Refer to AmigaDOS manual

:See Text.

:manual Refer to AmigaDOS ;manual :Don't change :Don't change :Don't change ;Don't change ;Don't change ;Don't change

A copy of this file is on disk. Some entries require explanation. Enter 0 as the unit number for your first hard drive. Unit numbers for additional drives are discussed in the 'Multiple Drives' section of this article. For an initial setup enter 0 for LowCyland enter the number of cylinders, minusone, for HighCyl. The interleave in the mountlist is ignored by Spartan, as your interleave has already been set by the low-level format. Enter the blocks-per-track of your SCSI drive (17 is usual), or if using an Adaptec controller enter 18 for the 4000(a) or 26 for the 4070.

Once this is complete, edit the Startup-Sequence of your boot disk and add 'Mount DH0:' as the first command. Reboot your Amiga using your boot disk. From the CLI enter:

Format drive dh0: name MyDriveName guick



1	PARTS LIST	
-	PART DESC	DIGI-KEY #
U1 U2 U3	74LS00 QUAD NAND GATE 74HC688 8 BIT COMPARATOR (74LS688 acceptable) AM5380PC SCSI BUS CONTRO	DM74LS00N MM74HC688N LLER (See article)
G1-3	047uld GERAMIC CAPACITOR	P4307(QTY 10)
C4	22uld TANTALUM CAPACITOR	P4521
RP1-3 RP4	8 PIN 220/330 ohm TERMINATO 10 PIN 1K ohm PULL-UP PACK	R PACK 01704 09102
SW1	8 POSITION DIP SWITCH	CT2088
J1 J2	50 PIN SCSI CONNECTOR 86 PIN EDGE CARD CONNECTO	AHR50G-ND DR C5-43
	18" SCSI CABLE 36" SCSI CABLE	A3AAT-5018G-ND A3AAT-5036G-ND
Digi-Key Brooks A P.O. Box Thief Riv 1-800-34	/ / 677 er Falls, MN 56701-0677 /4-4539	Computer Surplus Store 715 Sycamore Dr. Milpitas, CA 95035 (408)434-0931 Adaptec controllers

You may omit the quick option. However, unlike a floppy there is no need to write to each track. Your formatting will just take longer. You now have a fully useable hard drive which can be accessed like any other DOS drive!

NOTE: The AmigaDOS version 1.3.2 Format command has a small problem with Spartan. After formatting with the 1.3.2 Format command, you will get a 'Format Failed' message, and AmigaDOS will report 'Not a DOS Disk' if you try to access the drive. Reboot, and AmigaDOS will recognize the disk as being a properly formatted DOS disk. The older 1.2 and 1.3 versions of Format work without this problem.

Optimizing Performance

As you recall, when you performed your low-level format, you needed to enter the interleave. Interleave is the method that is used to store data on you hard drive in a manner best suited to your particular system.

This discussion of interleave will focus mainly on reads, but the same information pertains to writes as well. As a hard drive platter spins, the data is accessed one block (512 bytes) at a time, and then sent to the computer. As the platter advances to the next block, often the computer is not quite ready to receive more data, and the platter has to make a full revolution before the heads are again in position to read the block. However, this full revolution is much more time than the computer needed to be ready, and much time is wasted. This wasted time equates to low data tranfer speeds. What interleave does is alter the order in which blocks are read and written. On a hard drive without interleave (referred to as an interleave of 1), the data blocks are read/written sequentially:

But with an interleave, they are 'shuffled' evenly, as shown in this example of an interleave of three:

101112/07/02/17 (08103)24103/01/15/10/05/16/11/06/17/

As you can see, block 01 is three blocks from block 02 (thus an interleave of three), so that the order of access is read one, skip two, read the next, skip two, etc. The time spent skipping blocks allows the computer to catch up and be ready for data when the drive is ready to send it. If the interleave is too large, the drive skips blocks while the computer waits, and if the interleave is too small, the drive is ready before the computer and must make an additional full revolution.

What we want to do is select an interleave for the hard drive to get the best performance. The disk performance tester DPerf2 will help in this task. The author was kind enough to allow this program to be included with Spartan. Please take the time out now to read his documentation (on disk).

Run Dperf2 on your hard drive and write down the results. Re-format your drive (both low-level and DOS) with various interleaves to see what gives your system best performance. An interleave of 2 gives best performance with many drives.

Be careful of one bug in DPerf2. If for some reason it is unable to access the specified drive, it writes all over DF0:, so be sure to write protect the disk in DF0!!

Adaptec Users-

To use an interleave of 1, you must edit your mountlist to reflect one less BlocksPerTrack. For example a 4000(A) controller will now be BlocksPerTrack=17, and a 4070 will be BlocksPerTrack=25. You must reboot the Amiga, and 'MQUNT DH0:' for this to take effect. To go back to an interleave other than 1, restore your mountlist BlocksPerTrack, and reboot. Note that you lose your extra 10% storage with an interleave of 1. Refer to the Adaptec Manual for details.

All Drive Types-

The sequence for optimizing interleave:

AFormat or SFormat DOS Format Dperf2 repéat... (Adaptec users: edit mountlist and reboot if going lo/from an interleave of 1)

The Adaptec Controllers

Adaptec produces a line of hard drive controllers which allow standard IBM type (ST50612) drives to communicate as SCSI drives. Each controller supports up to two hard drives. The combined cost of one of these boards (as low as \$80 from some suppliers) and a surplus or used IBM type drive is often an economical way of adding drives to Spartan. The Spartan software supports the following Adaptec controllers.

4000	The original MFM model
4000A	The standard MFM model
4070	Supports ALL drives

The Adaptec 4070 is an RLL (Run Length Limited) controller. RLL is a method of string 50% more data on a hard drive than traditional methods. For example, a 20meg drive formats to 30meg using RLL. However, to make use of RLL encoding, an RLL certified drive must be used. Non-RLL (MFM) hard drives can be controlled with the Adaptec 4000 or 4000A. One great feature of the Adaptec controllers is an unique method of storing data. Due to this method of data storage, each drive formals to 10% LARGER than normal. So a 20meg MFM drive would format to 22meg, and a 20meg RLL drive would format to 33meg!

To use an Adaptec controller with Spartan you would require the following:

> Adaptec Controller with User's Manual (4000, 4000A or 4070) ST50612 type Hard Drive 34 Pin Card Edge Ribbon Cable 20 Pin Card to Socket Ribbon Cable

The user's manual does NOT come with the controller and has to be ordered. Refer to this manual for any questions you have regarding interfacing your drive to the Adaptec controller.

Multiple Drive Configurations

Spartan supports seven SCSI devices. Using Adaptec drives, this allows a system containing up to 14 hard drives! Although it is seriously doubtful that anyone would take it that far, it is possible. The following section details the information needed to attach additional drives to the Spartan system.

Adaptec controller users can add a second drive (drive 1) to the controller as described in the Adaptec manual Be sure to address your second drive as drive 1, and remove the terminator resistor from drive 0

Adding additional SCSI drives is not difficult. You need a SCSI cable with additional connectors to daisy-chain as many drives as you are using. Remove the terminator resistors from all but the last drive on the SCSI cable. Also, be sure your power supply can handle the load of the extra drives.

To communicate with drives, you need to set the SCSI address of the drive to an unused address between 0 and 6. Refer to your drive manual for details on how to configure your drive's SCSI address. Address 7 is reserved by Spartan. Use this SCSI address when performing the low-level format on this drive.

Each drive must have it's own mountlist entry to be used as an AmigaDOS drive. The unit number in the mountlist tells Spartan at what SCSI address to find the drive. The following chart demonstrates this.

MountList Unit # Assignments			
SCSI	Unit# Drive 0	Unit# Drive 1	
Ó	.Q	1	
1	2	3	
5	4	5	
3	6	7	
-4	8	9	
5	10	11	
6	12	13	
7	Reserved for Spartan		

Only Adaptec controllers with a second drive use the drive 1 unit numbers. All other SCSI drives use the Drive 0 numbers.

So, as an example, if you set the unit# in your mountlist to 6. Spartan will interpret this as drive 0 at SCSI address 3.

Once a drive has been connected to the system, and a mountlist prepared, the drive must be low-level formatted, mounted and a DOS format performed. The drive will then be ready for use.

Partitioning Your Drive

Unlike floppy disks, hard drives can be partitioned. What this means, is that one large hard drive can be made to act like two or more smaller ones. This is especially useful on very large drives to prevent file fragmentation, and speed disk access.

11

To partition a drive, you must again edit the mountlist. Each partition requires a separate mountlist entry. For example, you could partition a 20MB drive as one 10MB drive, and two 5MB drives. Lets call our 10MB partition DH0;, our first 5MB partition DH1: and our second 5MB partition DH2:

For the purpose of our example lets assume our 20MB drive has 600 cylinders. If we were to mount this as a 20MB drive we would have a mountlist entry with the following line:

LoCyl=0, HiCyl=599

To partition the drive we would first create mountlist entries for all three partitions (DH0: DH1: and DH2:). The mountlist entry for DH0: we would edit the cylinders as:

LoCyl=0, HiCyl=299

This gives our DH0: access to the first half of the drive. For drive DH1: and DH2, we would edit the mountlist entries as follows:

LoCyl=300.	HiCyl=449	;(DH1)
LoCyl=450.	HiCyl=599	;(DH2)

This gives both DH1: and DH2: one quarter of our hard drive, or 5MB each. Be sure that your partition's cylinders don't overlap. A complete example mountlist is on the disk with the filename Partition example. Remember that each partition requires it's own mountlist entry and device name.

The drive must be low-level formatted, however separate low-level formats are not needed or possible for partitions. Each partition must be be MOUNTed and separately formatted with the AmigaDOS format command.

Booting your Hard Drive

Although Spartan does not autoboot, it can be easily used as a system disk by means of your boot disk. First, copy the entire contents of an original Amiga Workbench 1.3 to your hard drive. Replace the sistartup-sequence on your boot disk with the startupsequence from the Spartan archive. You may want to copy 'disk.info', also. (I'm no artist, but I like it!). What this startupsequence does is simply mount DH0., ASSIGN all system directories to DHO;, then EXECUTE the startup-sequence in S: (now assigned as DH0;5).

To boot your system, power up your computer. Insert Kickstart if you have a 1000. Turn on your hard drive, and wait for initialization activity to cease. Now insert your boot disk, and everything else takes care of itself. Once the system is running, the boot disk is no longer needed.

Notes

Amiga 500 owners may wish to leave the boot disk in the internal drive at all times, and use a single switch to power both computer and hard drive. However, if the hard drive has not finished it's initialization when the startup-sequence starts accessing it, the system will lock up. To avoid this, insert an appropriate length WAIT command immediately after the MOUNT command in your startup-sequence The 5380 SCSI controller LC, is manufactured by several vendors, including AMD, LOGIC Devices, and NCR. I have tested the AMD and the LOGIC Devices versions, and of the two only the AMD device is compatible with the Spartan software.

Some ST506/412 drives have errors mapped on sections of the drive that Adaptec controllers do not format. These errors will cause AFormat to fail. Do not enter any errors mapped in a cylinder higher than your high cylinder, and any errors with a bytes-from-index higher than:

	4000(A)	4070
Interleave of 1:	9792	9817
Other Interleaves:	10188	10036

The most likely causes of a newly constructed interface to not work, are solder bridges and bad solder joints. Clean your board's foil side with isopropyl alcohol to make it easier to see any problems.

Check that your cables are all in good shape and are properly oriented. Inspect the pin one orientation of all IC's and resistor packs (RP1,2,3). If an IC was installed backwards, and the power applied, it was most likely destroyed.

Check that C4 is installed with the = as indicated in the drawing. If you put this in wreng, a small puff of smoke from it will probably let you know. If this happens, it can be replaced with a tantalum capacitor with a value of 15 to 22 uF at 6 volts or more.

Another likely problem is improper addressing of either the interface or of spartan device. Be sure you have selected a valid base address for your system. Check that you have properly set the dip switches on on your interface and that you have set the base address of spartan device using SetBase.

There are two simple troubleshooting programs in the Low-Level directory, A Test, and STest. These programs are paired down versions of AFormat and SFormat, which will not perform a format, just establish communication with the drive.

Conclusion

I sincerely hope that Spartan opens up your world of computing as much as it has for me. An Amiga with a hard drive is so much more powerful and versatile, that it's like using a completely new machine.

The etched and drilled circuit board and the hard to find AM5380 are available from the author. The prices are as follows:

Etched and Drilled Circuit Board	\$20,00
AM5380 SCSI Controller	\$15.00

Add \$1.50 shipping for each order. Write for quantity discounts on orders of five or more. Send check or money order to: Harker Electronics, 255 Valley N.W., Grand Rapids, MI 49504

I am unable to answer questions about Spartan by phone, but can be contacted by mail or via GEnie P Harker or CompuServe 71546,1665

CAD APPLICATION DESIGN—PART 3 OBJECT-ORIENTED CAD

BY FOREST W. ARNOLD

Introduction

C++, SmallTalk, Eitel, Flavors, objects, classes, BOOPSL OOPSL Nowadays, just about every software magazine you pick up has a reference to at least one of these programming languages or terms. It seems as though programmers all over the world have jumped on the bandwagon of object-oriented programming and are busily creating objects. Since we don't want to be left behind eating technological dust, we're also going to jump on board! We are going to develop an architecture for implementing geometric objects as true object-oriented objects. and develop several "classes" of objects for our mini-CAD program-and without an object-oriented language, just plain old ANSI C and some programming and software packaging tricks! But first, we need to take one more look at geometric transforms. and then see how to interactively create new graphical objects using the event-driven programming methods we developed last time (AC's Tech Vol 13).

Geometric Transforms Revisited

In Part 1 of this series, we discussed the geometric transforms used to translate (move), rotate, and scale (resize) geometric objects modeled with vectors, which are just point coordinates. Translations are the simplest transforms: we simply add a vector (x,y coordinate pair) to all the coordinates defining a model object. Scaling and rotation transformations are more complicated, since both of these transformations require "reference points." When an object is scaled, all the coordinates in the object either move away from the reference point or move toward the point, and when an object is rotated, all its coordinates move in a circle around the reference point. To correctly rotate or scale an object, we first translate the object's coordinates so they are relative to the reference point, rotate or scale the object, then translate it back to its original location.

How do we choose a scale or rotation reference point? One way is to have the CAD user make the decision by picking a reference point. Another way is to use the inflial "pick point" as the reference point, and still another way is to use an arbitrary point. This is the technique we used in Part 2 of this series. Objects were notated and scaled using the centers of their bounding boxes as the transform reference points. We will again use an arbitrary reference point to transform the objects in our mini-CAD program. However, instead of always using the center of an object's bounding box, the reference point will depend on the transform being applied. For rotations, the reference pointwill be the center of the object's bounding box; and for scaling transforms, the reference point will be the corner of the bounding box which is diagonally opposite the corner closest to the pick point on the object. Another common transform provided in most CAD systems is "flipping" objects. In this version of our mini-CAD program, we will add a "flip" menu item to our "Action" menu. Objects are flipped by interchanging their tops with their bottoms, or by interchanging their right- and left-band sides. As an example, suppose we have a triangle whose coordinates are;

81	91	10.11		-83	1
1	ò.	5	D		3

Figure 1 shows how this triangle will look after being flipped horizontally around the point (0,0) and vertically around the point (5,3). The transform to flip an object is just a scaling transform with negative scale values. Since objects are flipped with scaling transforms, a flip reference point is needed. In our mini-CAD program, we will use the pick point on the object as its flip reference point. The scale matrix to flip our example triangle horizontally around the point (0,0) is

0.17	10.111	71.41
0.0	1.001	910
2.5	9.400	1.00

And to flip it vertically around the point (5,3), the overall transform matrix is formed by the following sequence of matrix multiplications (in our program, we call our transform library matrix procedures to do this work):

Translate priginal 1	to ocalion	Scale			Trazi refe	viste o	o flip oint
	201 1 11 1 11	1000 1000 1000	2-0 7-3 7	202	 $\frac{1}{2}$	$\frac{c_1 c}{-\frac{1}{2} \alpha}$	8.4 110

As Figure I shows, after an object is flipped, it will not be in its original location, unless it is flipped around its center. Some CAD systems automatically move flipped objects back to their original locations.

New Program Commands

A CAD program which can transform objects is not very useful unless it can also create objects, so we are going to add object creation procedures to our program. The new procedures will enable us to interactively add rectangular shapes, polylines, and polygons to our model world. We'll also add procedures to delete objects, to view and modify an object's values using a



"Show/Edit" requester, to flip objects, and to move the individual points in a line or polygon. The following paragraphs describe the program commands associated with these procedures and the user actions for executing them.

Objects are added to a drawing window by first picking an "Insert" menu item, followed by a menu subitem for the type of object to insert. The menu item-subitem choices are "Insert-Shape," "Insert-Line," and "Insert-Polygon." Shapes are rectangles, lines are a series of two or more points connected by line segments, and polygons are lines whose first and last points coincide. Thus, polygons are just closed figures constructed with points and line segments. After the "Insert" menu pick is complete, the object is added by picking its starting coordinates, dragging the cursor to locate another set of coordinates, and then "clicking" the select button. For shapes, the two sets of coordinates define two of the rectangle's corners, and the shape insert action is complete. For lines and polygons, the coordinates define the first line segment. To combinue adding points to lines and polygons, one drags to another location and presses the select button to add the new point. The line and polygon insert action is completed by "double-clicking" the select button at the location desired for the last point. If the object being inserted is a polygon, the program will automatically add a line segment to connect the first point to the last point.

Objects are deleted by picking a "Delete" menu item, and then picking the object to delete. The picked object is deleted and erased as soon as it is selected. "Flipping" objects is performed in the same way. The "Flip" menu item and one of its subitems is selected, then the object to be flipped is picked. There are two "Flip" menu subitems: "Horizontal" and "Vertical." As soon as the object to be flipped is picked, it is erased, flipped around the pick point, and redisplayed.

The individual points in a line or polygon are moved by selecting the "Move" menu item, then selecting a point and dragging it to a new location. The command to move points is an implicit command: either the entire line or polygon, or just one of its points will be moved, based on what part of the object is selected. If the cursor is close to a point (within three pixels) when the select button is pressed, only the point is moved. Otherwise, the entire object is moved.

An object's location and size values can be viewed or edited by picking the "Show/Edit" menu item, then picking the object. A "Show/Edit" requester pops up in the drawing window when the object is picked. The requester contains labels and string gadgets which show the object's current position (minx,miny) and size (width,height). The selected object's values are changed by typing the new values into the labeled string gadgets. Changing the x and y values will move the object to a new position, and changing the width or height values will resize the object. Objects can be flipped by entering negative width or height values. The requester also contains "Modify" and "Cancel" pushbuttons. The requester is popped down by picking either of these pushbuttons. If the "Modify" pushbutton is picked, the selected object's values are updated and it is redisplayed. Otherwise, the object is just unhighlighted.

Each of these new program actions is implemented with event handler procedures and event chaining. Let's briefly review how event handlers and event-specific data are attached to Intuition's input objects (menus, gadgets, etc) and used to process input events. Recall that a pointer to an event handler procedure and a pointer to the data needed by the handler is placed into a structure typedel'ed "intuiExtension_t". A pointer to this structure is then attached to an Intuition input object. If the input object is a gadget or window, the intuiExtension_t structure pointer is placed in the "UserData" member of the gadget or window structure. Since Menultem structures do not have a UserData member where we can place our intuiExtension_t structure pointer, we define our own menu item structure which includes both Intuition's Menultem structure and our extension structure. The extended menu item structure is typedef'ed "myMenuItem_t." When an input event is received in "handleInput()," the intuiExtension_t structure pointer is retrieved from the input object, and the event handler is called using the function pointer. The event handlers either directly perform an action, such as closing a window, or place information in the program's state vector for use by another event handler. The state vector in our program is a structure called "world."

Let's look at the new program commands, the event handlers for each, and the data sent to the handlers. We'll then see how the handlers and data are used to implement the new commands. Table 1 lists the commands, the handlers responsible for the commands, and the data sent to the handlers.

Table One	New Program Commands				
Command	Event	Event Handler	Handler Data		
Insert-Shape	MENUPICK	miSetAction	insShapeData		
Insert-Line	MENUPICK	miSetAction	insLineData		
Insert-Polygon	MENUPICK	mSetAction	insPolyData		
Delete	MENUPICK	miSetAction	deleteData		
Flip-Horizontal	MENUPICK	miSetAction	fiipXOata		
Flip-Vertical	MENUPICK	miSelAction	NoYData		
Show/Edit	MENUPICK	miSetAction	showEditData		
Modify	GADGETUP	updateValues	seRequester		
Cancel	GADGETUP	cancelRequester	seRequester		

The last two commands in Table 1 are the "Show/Edit" requester commands which update an object after its values are modified, or cancel an edit action. The interface objects for these two commands are pushbuttons in the "Show/Edit" requester. The data sent to the event handlers for both of these commands are pointers to the requester containing the pushbuttons. The rest of the commands in Table 1 are menu commands. The data sent to miSetAction() for each of the commands are instances of a structure typedef'ed "miData_t" This structure contains a function pointer to an "action" function, an action modifier, and a pointer to whatever data the action function needs to do its job. Table 2 shows the miData_t structure members for each of the new menu commands.

Table Two	New Menu Command Handler Data Elements				
Structure Name	Action Procedure	Modifier	Action Data		
insShapeData InsLineData InsPolyData deleteData showEditData flipXData	dragAndInsert dragAndInsert dragAndInsert pickAndDeleta pickAndEdit pickAndEdit	None None None None FLIPX	shapeClass IneClass polyGlass None None None		
flipYData	pickAndFlip	FLIPY	None		

The action data for the first three structures are pointers to other structures. We will discuss these three structures in more detail below. They are used in "dragAndInsert()" to create shapeline, or polygon objects. The modifiers stored with the flip data are used in "pickAndFlip()" to determine which direction to flip an object.

Program File Organization

Since our mini-CAD program now has quite a bit of code, the source code has been split up and placed in several files, and the data structures and procedures in Table's 1 and 2 are no longer in a single file. The following is a complete list of all the program files and brief descriptions of their contents.

Program source code and include files

glóbalDels.h IeHandlers.h	global structure definitions and declarations. declaration of the event handlers and action procedures defined in tstObject.c
IstObject.c	main program, event handlers, action procedures, and Intu- ition-related procedures.
menu.c	menu definitions and menu procedures.
menu h	declaration of menu array, menu action modifiers, and menu procedure declarations.
bandleInput c handleInput.h	defines handlelnput() and handleDrag(), declarations for handlelnput() and handleDrag().
	Transform source code and include files
transform c	2d transform and matrix procedures
Transform.h	declarations and macros for transform and matrix procedures.
	Shape object source code and include files
shape.c	shape class and object interface procedures.
shape h	declarations for shape class interface procedures.
shapeClass c	implementation file for shape class and shape objects.
shapeClass h	public include file for shape class
shapeUbl.c.	geometric utility procedure definitions shape
Util.h	declarations for geometric procedures.
	Line object source code and include files
line.c	line class and object interface procedures.
line.h	declarations for line class interface procedures
IneClass.c	line class and line object implementation file
lineClass.h	public include file for line class.
1	Polygon object source code and include files
polyClass.c	polygon class and object implementation file.
polyClassP.h	private include file for polygon class.
polyClass.h	public-include file for polygon class.
	Make/Link files
IstObject.make	makefile for compiling the executable program, tstObject.tst
Object.ink	Trik file for linking object modules.

Implementing the New Program Commands

Now that we know what the event handlers for our new commands are, know where they are located, and know how to interactively use the commands, let's look at how the commands are implemented. All intuition events are received in handleInput(). When an event is received, handleInput() retrieves the pointer to the intuiExtension_t structure stored in the input object's structure. The function whose pointer is in the intuiExtension_t structure is then called. For all our new menu commands, miSetAction() is the procedure called by handleInput(). MiSetAction() is simple: it places the data sent to it into the program state vector (named "world") and returns. MiSetAction()sets the "action", "modifier", and "data" members of the "world" structure equal to the corresponding values in the miData_t structure pointer sent to it. If the next event received by handleInput() is a MOUSEBUTTONS event, windowEvent() is called to take care of it. For select button events, WindowEvent() calculates the world coordinates corresponding to the window coordinates where the button was pressed. If then stores both the world and window coordinates in the state vector. Finally, if the action member of the state vector contains a valid action procedure pointer, the action procedure is called. Our new action procedures are dragAndInsert(), pickAndDelete(), pickAndEdit(), and pickAndFlip().

DragAndInsert() is responsible for creating new objects. It retrieves the "class" structure pointer from the state vector and calls createShape(), which creates new objects by allocating and initializing memory for them. After an object is created, insertDrag()) is called. InsertDrag() takes care of the drag interaction for establishing initial locations and sizes for new objects. The new objects are then added to the list of world objects and displayed. InsertShape() adds objects to the list of world objects, and displayShape() draws them.

The action procedure for deleting objects is pickAndDelete(). It calls findObject() to see if an object is located at the coordinates where the select button was pressed. If an object is found, it is erased, removed from the list of world objects, and deleted. EraseShape() erases any object, removeShape() takes care of removing them from the list of objects, and deleteShape() frees memory allocated for objects.

The action procedure which pops up the "Show/Edit" requester is pickAndEdit(). This procedure determines which object was picked, highlights it, and then queries the object to determine its current location and size values. The position and size values are placed in the requester's string gadgets, and the requester is popped up. The pointer to the picked object is saved in the state vector so the action procedures which pop down the requester can tell which object was selected. This is all that pickAndEdit() needs to do, so it returns. While the requester is displayed, the values shown in the requester's string gadgets can be edited. The "Show/Edit" requester is popped down when its "Modify" or "Cancel" pushbutton is picked. When the "Modify" pushbutton is selected, its action procedure, updateValues(), is called by handlefuput(). This action procedure reads the edited values from the requester's string gadgets, pops down the requester, erases the selected object, and updates it with the new values. CancelRequester() is the action procedure called when the requester's "Cancel" pushbutton is selected. All it does is pop down the requester and unhighlight the selected object.

An object's data values are obtained by calling getShapeValues(), and they are updated by calling setShapeValues(). GetShapeValues() is called from pickAndEdit(), and setShapeValues() is called from updateValues(). Each of these procedures is sent an array of name-value pairs. "Name" is a data element identifier, and "value" is a pointer to a variable containing a value. GetShapeValues() returns the object's value corresponding to "name" in the value pointer. SetShapeValues()) places the pointed-to value into the object's data element identified by "name" (Querying and updating objects without knowing anything about them is a tricky problem. We'll take a look at the technique used by getShapeValues() and setShapeValues() to solve this problem a little later.

PickAndFlip() flips objects horizontally or vertically. It first finds the picked object, then examines the action modifier (FLIPX or FLIPY) stored in the state vector to determine which way to flip the object. If the object is being flipped horizontally, the (x,y) scale values are set to -1.0 and 1.0, and if it is being flipped vertically, the (x,y) scale values are set to 1.0 and -1.0. PickAndFlip() then erases the object and calls resizeShape(), sending it the "flip" reference point (pick point) coordinates and the flip scale values. ResizeShape() takes care of scaling objects. After resizeShape() returns, the selected object is redisplayed, and pickAndFlip() is done.

Moving the individual points in a line or polygon is a common CAD operation. Points are moved the same way enlire objects are moved: the point to be moved is selected, then dragged to a new location. DragAndMove(), the move action procedure we developed last time, has been enhanced to move points belonging to a line or polygon. After dragAndMove() finds a selected object, it calls findPoint(). If the selected object does not contain points which can be moved (shapes), findPoint() returns a NULL pointer. However, if the selected object is a line or polygon, the pick coordinates are used to determine if the pick. point is within a tolerance distance (3 pixels) of one of the line's or polygon's points. If so, a pointer to the point is returned. If findPoint() returns a non-NULL pointer, dragAndMove() calls dragPoint() and movePoint() to move the point. Otherwise, moveDrag() and moveShape() are called to move the selected object

Take another look at dragAndInsert(). It creates shapes, lines, and polygons without knowing what kinds of objects it is creating! If you look at the rest of the event handlers and action procedures in our program, you will see that none of them know what kinds of objects they are managing! DragAndInsert(), the event handlers, and the action procedures in our program illustrate two important features of object-oriented programming: data hiding and polymorphism. The only information our program knows about the objects in it is how to call their procedures. It does not even know the actual types of the objects. To our application code, all objects are of type "object_p", which is an anonymous type used to hide an object's real type. Notice also that all objects, whether they are shapes, lines, or polygons, are displayed by calling displayShape(). Internally, displayShape() uses a function pointer to call the correct object drawing procedures without knowing what procedure it is calling. If the object is a shape, the code to draw shapes is called, and it it is a polygon. the polygon drawing procedure is called. "Polymorphism" (many forms) is the term used to describe this feature of object-oriented programming. In the remainder of this article, we will take a closer look at the concepts and charactenstics of object-oriented programming, and develop an object-oriented "framework" for implementing geometric objects. Let's get started with "objects" and "classes."

Objects, Classes and Abstract Data Types

The "object" and "class" concepts in object-oriented programming have the same meaning as they do in everyday language. Things (objects) which are similar are grouped into categories called classes. Similar classes, in turn, are grouped into categories of superclasses and subclasses. Mammals, for example, are a subclass of a class of living creatures called animals. Carines are a subclass of mammals. Subclass objects are similar to their superclass objects, but are also different in some recognizable way. Software objects are grouped into software classes the same way that real objects are grouped into classes. all software objects which share the same data definition and the same functionality belong to the same software class. The individual software objects which belong to a class are called "instances of the class," or "class instances."

Software classes are more than just conceptual groupings of similar objects. They are programmer-defined data types. They consist of definitions of their instance objects' data structures, code implementing their objects' behavior, and a mechanism for linking instance objects to their code. In C++, the "class" construct is a feature of the language. It provides support for programmerdefined data types, which are managed automatically in almost the same way built in data types such as integers and doubles are managed. Since we are not using C++, we have to create our classes and manage them ourselves. The basic programming construct for creating programmer-defined data types in C is "data abstraction."

An abstract data type consists of a data definition, the code for managing and manipulating the type (data definition), and a description of how to use the type. The transform structure and code we created in Part 1 is an example of an abstract data type. We created a data structure, typedef ed it as "transform2_1," and wrote all the code needed for using transform2_t structures. We created a programmer-defined data type. To use transform2 1's, we do not need to know anything about their internal data structure or how their code works. All we need to know is which procedures we can use with them, and how to call the procedures. We implement and package any abstract data type the same way we did our transform2_t data type: all the code for the data type is placed into a single source code (xxx.c) file, and the structure and procedure declarations programs need to use the data type are placed in an include (xxx h) file. This is the way we packaged our transform data type. The structure definitions and code for object-oriented objects are packaged in a similar way. Classes consist of the "package" of code, structure definitions, and structure declarations for a single type of object. A class is the implementation of an abstract data type, and objects which belong to the class are "variables" of the data type.

Data Hiding

The only problem with abstract data types is that the implementation details (data structures and code) for the types are usually visible to programs using them. Since the implementation details are visible, the data elements for abstract data types can be directly accessed and modified. This is a temptation most programmers easily succumb to, usually under the banner of "efficiency." To remove this temptation, the data structures and code for object-oriented objects are hidden from applications which use them.

To hide class implementation details, the prgram places the structure and procedure declarations for a class's objects into two include files. One include file is "public" and contains declarations needed by applications. The other include file is "private" and contains declarations needed by the class. As an example, the three files containing the implementation of shapeClass are shapeClass.c, the source code file, shapeClassP,h, the private include file, and shapeClassh, the public include file. For our object-oriented implementation, brand new classes need two additional files. One is a source code file containing applicationclass "interface" code, and the other is an include file for programs using the interface code. Shape.c and shape.h are the two interface files for shapeClass. All the include files for our three object classes (shapeClass, lineClass, and polyClass) are in Listings 1 through 8.

In our mini-CAD program, all objects are visible only as an opaque pointer type, "object_p" (actually a "void *"). The real structure definitions are contained in the private include files. Unless the private files are included in our program (cheating!), we cannot access or modify the data elements for our objects. Further, all the internal procedures for each of our object types are declared "static.". Since static procedures are not visible outside their file, we can not directly call the procedures which implement the functionality for our objects. This brings up a question: If both the data and the code for objects are hidden, how can the objects even be used?

Binding Data to Code with Pointers

I mentioned above that classes contain a mechanism for linking the data for their objects to their code. This mechanism is a structure containing function pointers which point to the code for the class's objects. The structure containing the function pointers is called a "class structure." It is declared in the private include file for a class and initialized in the class's source code file. A pointer to the class structure is made available to code using the class's objects as an opaque type in the class's public include file. The opaque class structure pointers in our program are named "shapeClass," "lineClass," and "polyClass." Their opaque type is "class_p." The class structure pointers are used by our program when it calls createShape() to create objects.

The first structure member of our object structure is a pointer to its class structure. The class structure pointer member of an object is initialized when the object is created. By including the class structure pointer as part of an object's data, objects are indirectly linked to their code, Figure 2 shows how object structures, class structures, and object procedures are all linked together with structure and function pointers. Since the data structure for an object contains a pointer to its class structure, which in furn contains pointers to the class's procedures, an object's procedures can be indirectly called using its data structure. Here is a code fragment showing how the "display" procedure for shape objects is called:

```
unics version version /* over depend street pointer */
version fusion clusses /* snape cluss statust pointer */
version of our clusses versions; v* det cluss pointer */
version decidey (street, sendow); v* value papers */
```

Because an object's procedures (operations) can be called through the class pointer which is part of the object, objectoriented objects are "active" data, and are sometimes referred to as "actors." It is apparent from the above code fragment that to correctly manage all the structure and function pointers associated with objects, knowledge of at least part of the implementation details of objects and classes is needed somewhere. This knowledge consists of several pieces of information. Some code needs to know that object structures contain class pointers and that class structures contain function pointers. In addition, knowledge of which function pointers are contained in a particular class structure, and what their linkage variables are, is also needed. We do not want this kind of knowledge embedded in our CAD application code, since it would have to perform type checking and type casting to correctly use our objects. In tact, as mentioned above, this kind of knowledge is not even available to our application code.

When a new class is created, "interface" code for using the class and its objects is also created. The interface code is a set of procedures which provide access to a class's objects and their functionality. The interface code for a class is referred to as its "message interface" by object-oriented programmers, and calling one of the interface procedures is referred to as "sending a message" to an object. Most class interface procedures do no more than the code fragment shown above, they just retrieve the class structure pointer from an object, then retrieve a function pointer from the class structure pointer and call the procedure.

The interface procedures for our objects are in the files shape.c and line.c Shape.c contains interface procedures for using any shape object, and line.c contains procedures for using line and polygon objects. The code in shape c knows that shape objects contain pointers to a shapeClass structure, knows which function pointers are in the shapeClass structure, and knows how to call the shape object procedures through the function pointers. The code in line.c contains the same information about line object structures and the lineClass structure. The procedures in shape.c and line.c are the ones called by the "action" procedures which implement all of our CAD functionality.

The interface procedures for a class do more than simply provide access to the class's objects. One important function they perform is shielding application-specific program code from changes in data structures and code. The way classes and objects are defined and implemented can be changed without affecting the way they are used and accessed in application programs, as long as the way the interface procedures are called does not change. In addition, when combined with structure overloading, the interface procedures provide an important feature of objectoriented programming known as "polymorphism."

Structure Overloading, Subclasses, and Polymorphism

If we analyze all the different types of operations needed in CAD programs, we see that most CAD operations are common to all objects, whether they are circles, lines, text strings, or others. All CAD objects need display, erase, highlight, rotate, and scale operations, among others. However, some object types also need to perform operations which are not performed by other objects. Lines and polygons need operations for manipulating their individual points, such as an operation for moving the points. Circles and text objects do not need these operations. In addition to a common set of operations, graphical objects also have a considerable number of common data elements. In our mini-CAD program, the data structures for all our objects contain pointers to their class structures, linked list "next" pointers, and bounding box coordinates. If we group the members of our structures so that those members which are common to different objects are in the same positions in their structures, we can use "structure overloading" with our classes and objects. Structure overloading is a technique for defining new structures by adding structure members to the end of existing structures. The technique allows code written for existing structures to be used for the new structures. This technique is extensively used in object-oriented programming, and is also widely used in the Amiga system software (message and library structures, for example).

For our graphical objects and classes, the data elements common to all graphical objects are placed in the structure for shape objects, and the function pointers for functions common to all graphical objects are placed in the class structure for shapeClass These structures are defined in shapeClassP.h (Listing 1). Notice that macros are used to define the structure members. Macros are used because they reduce the effort required to overload the structures and change structure definitions. Now take a look at the class and object structure definitions for lineClass and lineObject in lineClassP.h (Listing 2). The structure definition for lineClass is almost identical to the structure definition for shapeClass. The only difference is that lineClass extends (overloads) shapeClass, adding three new function pointers. Similarly, the structure definition for lineObject extends shapeObject's structure by adding a "points" pointer to shapeObject. Finally, take a look at the structure definitions for polyClass and polyObject in polyClassP.h (Listing 3). Other than containing empty macro definitions as placeholders, these structures are identical to the lineClass and lineObject structures. These are all examples of overloaded structures. Let's line up our structure definitions side by side and compare their members. Table 3 compares our class structures and Table 4 compares our object structures.

Table Three Cla	ss Structure Member	S
shapeClass_1	lineClass_t	polyClass_t
CLASS_PART SHAPEC_PART	CLASS_PART SHAPEC_PART LINEC_PART	CLASS_PART SHAPEC_PART LINEC PART
		POLYC PART

Table Four Ot	oject Structure Membe	rs
shapeObject_t	lineObject_t	polyObject_1
OBJECT_PART SHAPE_PART	OBJECT_PART SHAPE_PART	OBJECT_PART SHAPE_PART
	LINE_PART	LINE_PART POLY_PART

Structure overloading can significantly reduce code volume and eliminate code duplication. We can see why this is true from our class and object definitions. Since the definitions of lineClass and polyClass include the definition of shapeClass, all the code which "knows" about shapeClass can be used to manage and manipulate the shapeClass part of the lineClass and polyClass structures. In the same way, the code which knows about lineClass can be used for the lineClass part of the polyClass structure. These statements are also true for our overloaded object structures. In our mini-CAD program, shape, c contains the code which is used for all our overloaded class and object structures, and line c contains the code for the overloaded line and polygon classes and objects. As far as the procedures in shape: care concerned, all class structures are shapeClass_t's and all object structures are shapeObject_t's. The procedures in line c view all the class and object structures sent to them as lineClass_t's and lineObject_t's.

Let's return to our "display" example and see what happens when objects are displayed using function pointers from our overloaded structures. Suppose we have created and added a shape object and a line object to our model world, and are ready to redisplay all (both!) of our objects. To do this, we call "draw All()", our application procedure which redraws all our objects. Here is the code from drawAll() which redisplays the objects:

```
ob; = world.objects;
while( obj /
      (Void(displayShape(on),window))
      obj = nextShape(ob));
1
```

DisplayShape() and nextShape() are defined in shape.c. and here are their definitions:

```
int displayShame; object_p object.window_p window /
     CIASS_D
                  class = getObjectClass(chiefs).
     phapeClass_p shapeC = getShapeClass(class);
     af i / object || / shapeC || / shapeC-sdisplay )
        return it
     return (*ishapeC+sdisplay); (object, window);
1
object_p_nextShapo1_object_p_object_1
1.
     shapeObject_p shape = (shapeObject_problect;
     i special i lac
        return NULL:
     return lobject_pishape->nmXt;
```

The first thing displayShape() does is retrieve the class pointer from whatever object is sent to it (getObjectClass and getShapeClass are macros defined in shapeClassP h to retrieve and cast class pointers). If the object is a shape object, the class pointer points to shapeClass. If it is a line object, the class pointer points to lineClass, but displayShape() does not know this. Since the lineClass structure overloads the shapeClass structure, it can besafely cast to the type, "shapeClass_p", and its members can be accessed and used as if it really were a shapeClass_p structure pointer. After making sure none of the pointers are NULL, displayShape() uses the display function pointer to call the

object's drawing procedure. For shape objects, the procedure which draws shapes as rectangles is called, and for line objects, the procedure which draws polylines and polygons is called.

NextShape() works in a similar manner. It casts whatever object pointer is sent to it to a shapeObject pointer, and simply returns the 'next' structure member stored in every shapeObject structure. Since lineObject and polyObject structures overload shapeObject structures, nextShape() can access these structures in exactly the same way it accesses shapeObject structures.

As these two examples show, the procedures which are used for shape objects can also be used for line objects and poly objects, since the first part of their structure definitions are identical to the structure definition for shape objects. This means that either line objects or poly objects can be used wherever shape objects can be used. However, the opposite is not true; that is, shape objects can not be used wherever line objects are used, nor can line objects be used wherever poly objects are used. Imagine what would happen if the procedures in line.c cast the shape class structure pointer to a line class structure pointer and tried to call one of the procedures line class adds to shape class! Most likely, the software gremlin which lives in all code would probably wake up and go to work! The generic interface procedures written for an extended object structure prevent this from happening by looking at an object's class structure to determine whether it contains the necessary extensions before attempting to access them. This is similar to type checking. The procedure isClassInstance() in shape c compares an object's class structure pointer with an input structure pointer to see if they match. Here is a code fragment showing how the generic procedure findPoint() in line c calls is ClassInstance() to verify the object sent to it is a line object or an object which extends line objects before it calls the findPoint procedure line class adds to the shape class structure definition:

```
۰.
   make sure the unject is either a lineObject or
   an object which is an instance of one of line
   class a mbclasser.
87
if ( 2 isClassIngtance(object,lineClass) )
     POSSER NULL:
if | limet wfindFoint )
     return ("flipsC-stindPoint)(object,px,py,en4);
And here is the definition of isClassInstance( ):
```

int indianimitance | ubject p object class p class)

1.0

```
TIASS_D
              engliant : getChysetClust(chrect);
shapeClass_0
              shuped = getShapeCiass(cbgClass);
while i maped )
   it / (class_p)shaped an class !
           return 1:
  shapeC : getShapeClash(shapeC-shupepClass);
TTUMPE OF
```

As we will see shortly, each class structure contains a pointer to the structure it overloads. The pointer is the structure member named "superClass". isClassInstance() first retrieves the class structure pointer from the input object. Inside the "while" loop, the retrieved pointer is compared with the input class pointer, and if they match, isClassInstance() returns 1 to indicate the class pointers match. Otherwise, the pointers to the overloaded class structures are retrieved from each class structure and compared with the input class pointer. The loop continues until the root class structure (shapeClass) has been reached and compared. When the code in line,c calls isClassInstance() and sends it a lineObject, the companison succeeds immediately. If the object is a polyObject, the first comparison fails, since polyClass does not match lineClass. The second comparison succeeds, since the superClass pointer retrieved from the poly class structure points to the line class structure. However, if the object is a shape object, the comparison will fail, since the shape class structure does not overload the line class structure.

When our application code calls the interface procedures in shape,c and line,c, it does not know what kind of object it is sending to the procedures, and the called procedures do not know the "real" type of object sent to them. Nevertheless, the correct procedures for our different classes of objects are called. In object-oriented terminology, this type of functionality is called polymorphism, and it is one of object-oriented programming's more powerful features. Polymorphism allows us to remove type checking from our code-no more massive switch statements to decide which procedures to call, and no more special case code for different objects-we just call a procedure and the "right actions" are performed! What is almost magical about polymorphism is that we can add brand new objects and classes-created by overloading the shape class and shape object structures-to our program, and our existing code will automatically work without any changes or additions! Think about the significance of these statements.

From a conceptual viewpoint, lineClass and lineObject are specialized versions of shapeClass and shapeObject, and polyClass and polyObject are specialized versions of lineClass and lineObject. Our overloaded structures form a hierarchy of class structures, together with their instance objects' structures. ShapeClass is a "superclass" for both lineClass and polyClass, and lineClass is a superclass for polyClass. Another way to describe the same hierarchical class relationships is by saying polyClass is a "subclass" of both lineClass and shapeClass, and lineClass is a subclass of shapeClass. Subclasses specialize existing classes by adding new data or functionality, by modifying existing functionality, or both. With a few pointers and a couple of programming techniques, we can use structure overloading to implement "true" subclasses and "method inheritance," another powerful feature of object-oriented programming.

Inheritance

If was mentioned above that all the procedures in a class are defined as static, and thus are not visible outside their definition file. This would seem to be a major flaw in object systems, since static procedures cannot be shared among different classes, even subclasses of a class which defines a static procedure. However, object systems use a technique called "method inheritance" to remove this restriction. Method inheritance enables subclasses to use procedures defined by their superclasses without knowing the name of the procedures or where they are defined.

You may have noticed in our CAD program that all objects are moved, resized, and rotated in exactly the same way. There is a good reason for this: all our classes use the same drag procedures for moving, sizing, and rotating objects. The procedures are moveDrag(), sizeDrag(), and rotateDrag(), and they are static procedures defined in shapeClass.c. LineClass and polyClass inherit these procedures from shapeClass.

To implement method inheritance, we either need a way for subclasses to get function pointers from their superclasses, or we need a way for superclasses to initialize function pointers for their subclasses. We will implement method inheritance the second of these two ways. Four requirements must be fulfilled for this to work. They are

- Each class which implements an inheritable method defines a special "inherit" symbol for the method, and the special symbol is made visible to subclasses. Subclasses which need to inherit a method place the special symbol in the function pointer member corresponding to the procedure to be inherited.
- Each class needs a setup() method which initializes the structure members for its class structure and the class structures for its subclasses.
- Each class needs to keep a pointer to the class structure of its superclass so it can call the setup() method of its superclass.
- 4. All method inheritance for a class and its superclasses must be resolved before any class methods other than setup() can be called. This requirement is met by calling a class's setup() method the first time one of its objects is created.

Let's look at the polyClass structure to see how it is initialized, then step through code fragments from all three of our classes to see how polyClass inherits moveDrag() from shapeClass and inherits display() from lineClass. Notice that almost all of polyClass's function pointer members are named "inherit... These are the names of the "special symbols" defined by shapeClass and lineClass so the methods they define can be inherited. They are the names of procedures which do nothing except return an error code. The "inherit..." procedures are declared in the private include file for a class, and defined in the class's source code file. Since subclasses include the private include file of their superclasses, the names of the dummy "inherit" procedures are visible to them. Subclasses let their superclasses know which methods they want to inherit by placing pointers to the dummy procedures in their class structure. This is the class structure definition for polyClass:

statle shapeClass_p supervises +

	11	hipeClass_pi)_li	rieCLAUD:
outyfiss_1_polyCrass			
1			
(class_p)A_lineTlast,	13	-apoteljas-	• /
016	14	flugWord	·**
wishes (polyObject_t).	10	objectsize	· · · /
(* methods specified by	0710	DICLASS	
setup,			
NOL	74	init laisze	

med to a policit in the station of the second

Method inheritance is triggered when createShape() is colled For polygons, the class structure printer sent to createShape is pulyClass. CreateShape() casts the class pointer to "shapeClass_p" and looks at the flagWord member to see if the class has been initialized. If not, the setupClass() procedure for the class is called using the function pointer to the class's setup method. Here is the code which does this:

Since the class pointer sent to createShape points to polyClass, createShape() calls polyClass's setup method. PolyClass keeps a pointer to its superclass (lineClass), and after it completes its setup processing, calls its superclass's setup method, sending its class pointer to it. Here is the code from polyClass's setup() method

LineClass defines a display method which draws polylines and polygons. This is the procedure polyClass wants to inherit. LineClass's setup method examines the "display" function pointer member of the class pointer sent to it. If the display function pointer points to inheritDisplay(), it is replaced with the pointer to the display() procedure defined by lineClass. After lineClass's setup procedure finishes its processing, it calls shapeClass's setup procedure.

```
static int setup; class_p_class )

IIntClass_p (intC = (inteClass_p)(class;
If (inteC-sumplay is interitOmplay )
InteC-sdisplay : display;
...
(vold)(fisuperClass=setupClass))(class))
InteC-singNon (f (_INTFIALLERD;
I
```

ShapeClass also defines a display method which can be inherited, so it also looks for a function pointer to inheritDisplay(). However, since the inheritDisplay() function pointer has already been replaced by a pointer to lineClass's display method, shapeClass does not find the inheritDisplay() pointer in the polyClass structure. ShapeClass's setup method looks for function pointers to all the inherit...() procedures defined by shapeClass, so it finds the pointer to inheritMovedrag() in the polyClass structure. It then replaces the inheritMoveDrag() function pointer with the pointer to the movedrag() procedure defined for shape objects:

When shapeClass's setup() procedure finishes, all the inherit...() function pointers in the polyClass structure have been replaced by procedures defined by either lineClass or shapeClass. The way method inheritance works and can be implemented should be clear from this example. Its significance should also be apparent: very little code is required to implement fully-functioning polygon objects, since almost all of their methods are inherited.

You are probably wondering why such an elaborate scheme is used to implement inheritance. Why not just make class procedures visible to their subclasses, and let the subclasses explicitly initialize their own function pointers? The main reason we have implemented inheritance as illustrated is that subclasses can automatically inherit procedures without knowing which of their superclasses defines the inherited procedures. This technique

21

enables us to add new procedures to a class without having to change its subclasss's class structures. For example, suppose we define a moveDrag() procedure for lineClass which will draw polylines as they are being dragged around, instead of using shapeClass's moveDrag() procedure which draws a box. The inheritance scheme we have implemented will result in polyClass, and also any future subclasses of lineClass, automatically inherting the new moveDrag() procedure. Automatic inheritance is one of the reasons object-oriented systems are ideal for rapid prototyping: new object classes can be implemented quickly with very little new code. Later, when the new classes are working correctly, methods which are more appropriate for the new objects can be written to replace the methods which were inherited during prototyping.

Object systems employ several other techniques which enable subclasses to use methods defined in their superclasses. One technique is "method chaining," and another technique is "superclass dispatching." Superclass dispatching occurs when a method in a subclass calls a corresponding method in its superclass. The example just discussed uses superclass dispatching the setup() procedure in each class calls the setup() procedure of its superclass. Method chaining is more complex, and is best explained with an example. Method chaining is generally used when objects are created and destroyed.

Creating and Destroying Objects

All our graphical objects are dynamically created at runtime in dragAndInsert(), which calls createShape() to actually create an object and return its pointer. Several steps have to occur when objects are created: first, memory for the object needs to be allocated; next, the object has to be "bound" to its class structure: finally, the object has to be initialized. Allocating memory for an object and binding it to its class structure is easy. Initializing an object is a bit tricky. Here is the object creation code from createShape() and from the static procedure initialize() in shape.c which performs these steps:

```
shopeflows_p shopef.:getShopeflows(class);
shopeflows_p shopef.:getShopeflows(class);
shopeflows_p shope = N(0,)
'* allocate memory for the object *,
thope = (snapeflopecf_p)mation(phypeflowsportSire);
shope=sclass = class;
shope=sclass
```

```
class_p super ( getSyperClass(class()
shapeClass(class(class())
)*
```

t carussively toll boil with we get to the root

22

```
* clues (has no superclass)
**
(i ) super (
    ii ) vo(clutive(shiect.super) )
        return );
(* oull each class sawe return from recoration */
(f ) shapeC-vioitialize (
    return (*)shapeC-vioitialize()(shiect);
    return (*)shapeC-vioitialize()(shiect);
```

The only variable sent to createShape() is a pointer to the class structure for the object being created. As noted earlier, the class structure pointer is the menu "action data" for the "insert" menu item. CreateShape() casts the class structure pointer to a shapeClass pointer, allocates memory using the object size information stored in the class structure, and binds the new object to its class structure pointer. CreateShape() then calls initialize() to take care of initializing the rest of the object's data values. The new object is initialized using method chaining: the initialize() methods for the object's class and all its superclasses are called, from the "root class" (shapeClass) first down to the object's class. This form of method chaining is called "downward chaining." and it is used to permit every superclass to initialize the object structure members they are responsible for. The object's superclasses are called in superclass to subclass order so that each subclass can "override" (change) any values initialized by their superclasses. If a subclass does not need to perform any initialization other than that done by its superclasses, it does not need to provide an initialize() method. Initialize() uses recursion to follow superclass pointers until it reaches the root class, shapeClass. As the recursive calls "unwind," initialize() calls the initialize method for each class which has one.

Objects are destroyed in a similar manner, except "upward chatning" instead of downward chaining is used. When upward chaining is used, class methods are called in subclass to superclass order. Here is the object destruction procedure from shape.c showing how upward chaining is used when objects are destroyed:

```
Int deleteShaper covert p top-ect )
     Cibbb D
                  class - getUbject/lass/*object);
     shapeClass_p_shapeC : getShapeClass(class);
     10.
      · call superclasses in synclass to superclass order
      .
         to perform postdestruction object cleanup.
      14.)
     while I shapping ?
         il i shapet duallemapu i
                 ivoid((*(o)(apeC-sdoallocate())/*abject);
         waped : wetShapeClass(shaped-sruperClass);
     114
         free the object
     LC ( Mablest I)
         free! Wold*I*object 1:
     "walker = 891L)
cotuer us
```

Upward chaining occurs inside the "while" loop in deleteShape(). The code looks at the deallocate function pointer in the class structure pointer, and if it is not NULL, calls it. Next, the pointer to the class's superclass structure pointer is retrieved, and if the superclass has a deallocate method, it is called. The while loop ends after the root class (shapeClass) is reached. DeleteShape() then frees the memory allocated for the object structure

Why are objects destroyed this way? Why not just free the memory allocated for an object? Any object may contain pointers to internally-allocated memory, and it so, the internal memory needs to be freed before the memory allocated for the object structure is freed. DeleteShape() does not know what kind of object is being destroyed, and does not know it it contains pointers to dynamically-allocated memory. Chaining through all the deallocate methods for a class and its superclasses insures that any class which allocates memory for its objects can also free the memory before the object memory is freed.

Object creation, initialization, and destruction are complex operations in object-oriented programming systems. Many details have to be taken care of to insure these operations are performed correctly and completely. Two other complex operations are generically accessing and modifying an object's data values.

Accessing and Updating Object Data Values

PickAndEdit() calls getShapeValues() to determine data values for an object so they can be displayed in our program's "Show / Edit" requester, and updateValues() calls setShapeValues() to update an object's data values after they are modified. Both getShapeValues() and setShapeValues() use a technique which is common in object systems: an array of structures containing "tags" and values is filled in and sent to a method which quenes or modifies an object's values. The "tags" identify data elements which are to be returned or updated, and the "values" are either actual values or pointers to variables which hold the actual values. Tags are identifiers which uniquely identify an object's data elements. They are defined in many different ways by different object systems: some use actual strings, some use macro definitions, and still others use hash functions to generate tags from data element names. Our program uses a simple technique for generating tags. Each object structure member is assigned a unique name in the class responsible for the structure member. and a pointer to the string which points to the name is defined. The pointer to the string pointer is exported as an "atom" in the class's public include file, and is used as the data element tag. There are several advantages to this approach: it is simple, the compiler and linker will guarantee the tags are unique within a task: pointers can be directly compared for equality; and finally, the name can be accessed it needed.

To make using tag-pointer value pairs easy, we define a structure to hold the pairs, and a macro for setting up the array values. The definitions from globalDefs h are:

```
) (art)) (rt) - argètime (atom) -
10191 - 11 (rt) (rt) (rt) (rt) (rt)
```

When we need to query or modify an object's data values, we set up an array of arg_t's, initialize the values, and call getShapeValues() or setShapeValues(). Here is a code fragment from pickAndEdit() which shows how the arg_t structure array and pointer variables are declared, how the array is initialized, and how getShapeValues() is called:

GetShapeValues() retrieves the object's 'getValues' method from its class structure and calls it to process the arg_tarray. Here is the code from shape class's getValues procedure which returns the class name for shape objects:

-1 -1 applies routers of instance tor a

```
wtropy(coherticary[x])arghte_tumper(c
contented)
```

There are two weaknesses in using tag-pointer pairs to access and update data values for objects: first, the tags which a class of objects recognizes must be known; and second, the value pointers must be the correct data type and data size. For example, to access an object's class name, our mini-CAD application needs to know that all objects recognize "classNameAtom" as a tag, and that the type of value associated with the tag is a character array which can hold a maximum of 32 characters. The first weakness is minor, since a class which does not recognize an atom just prints an error message and ignores it. The second weakness can have serious side effects (memory corruption) if a value is assigned to a data type which has too few bytes to hold the value. The tags for a class and its subclasses are made known to application code by being declared in the class's public include file. The associated data types for the tag value pointers are placed in comments next to the tags, and applications querying or updating object data values are responsible for making sure the pointed-to variables are the correct type and size. Here are how the declarations from shapeClass.h for classNameAtom and xLocationAtom look:

```
extern const along classNameAtum; /* chast,32 bytes */
```

Finally, here is how classNameAtom is defined in shapeClass.c

```
athlic char "Const _ClassWame : "classWame";
const atom_p classWamektom : latom_p(A_classWame;
```

Modifying an object's values is more complicated than accessing its values. The values are modified in basically the same way they are accessed. However, after the values are modified. the object needs to know which ones were modified so it can perform any actions required because of the modifications. As an example, when the width and height values for objects are changed to negative values, they need to be scaled (to flip them) and moved back to their original locations. Additionally, subclass objects may need to disallow some modifications which their superclass objects allow. Because of these considerations, setting an object's values using tag-value pointer pairs is a twostep process. Modifying the object's values occurs first. After this is complete, an "update" method for the object is called and sent the modified object, along with an unmodified copy of it. The object's update method then compares its new values with its old values to determine which values changed. The update method can disallow changes by setting the modified values back to their original values, allow some values to change, or allow all values to change. Based on which values changed, the update method can perform any additional processing needed to insure the integrity of the object is maintained. The following code from setShapeValues() shows how this two-step process is done

```
14.1
   create a shallow copy of the usedified object
 * The copy is used by the class to determine which
 · object values were changed,
 47
copy = [object_b]millociahapeC-sobjectSize1;
memory ( Wrinty copy, Wold*) object, whopeC-sobjectSize;;
 * set the object values
(vn.d) (* (shapeC saetvalus)) (object, side, h);
 · send the updated object and the unwedified copy
· to the class so it can validate the modifications

    and perform only occlose needed to maintain

* The intenzity of the object
 w.)
itissape'-suplate() ibbject, copy(window);
AL ROOT+PRIME
SPEAR CPL:
```

You can look at the setvalues and update methods in both shapeClass.c and lineClass.c to see how objects are modified and see the types of actions required when an object's values are changed.

Other than the procedures for creating and destroying objects, and for accessing and updating an object's data values, the rest of the procedures in shape.c, line.c and the three class modules are relatively easy to understand. In fact, the procedures in the class modules are basically the same ones presented and discussed in Part II of this series.

Summary

In Part 1 of this series of articles, I promised that we would develop a basic CAD program. We have almost achieved that goal: we developed a library of transform procedures and a set of procedures and techniques for handling Intuition's input events in Part 1 and Part 2. In this article, we developed a framework for implementing geometric models using objectoriented programming techniques, and saw how to implement several classes of geometric objects. In my next article, we will see how new classes of objects are implemented using our objectoriented framework, and add rectangles, circles, and ellipses to our mini-CAD application. We will then have a mini-CAD program which can be easily extended to include both new objects and new functionality.

```
Listing One
                 shapeClassP.h
                                   addedie accologica versus a set/
    histing 1. Private include flip for shapeliase.
    shapeClassF.b - unlines class structure and object
                  structure for shapes.
   The structures defined here dis common to all
   geometric classes and objects. Now class and object
   structures are created by overloading (extending) the
   phageClass and phageObject structures defined nore.
    (c) Copyright 1991, Forest W. Armold
   All rights reserved.
÷1
Itthdef SHAPECLASSP_DEFS
Idetine SHAPECLASSP_DEFS
#include "globalDets,D*
sinclude "anapeClass ft"
1.0
1
   class flag values
57
Wdefine IS_INITIALIZED 1
14
κ.
   Shape Class Part - Delines the shape close part
.
   of a shapellass structure. The CLASS_PAST
.
   consists of information about the class and its
   objects, and a "setup" procedure which is called
   to complete initializing the class structure
.
   when the first object is created.
   The SRAPEC_FART consists of function pointers
.
   to the methods for a cidas
4.1
```

24

```
HUCTING CLASS_WART \
                                                                    shapeObject structure definition
   DIASS_D
                   SUDEFCIARE! \
                                                                    All shapeobjects and objects whose class is
                   / DagWord?
   unmamed long
                                                                    a subclass of shapeClass will consist of an
   unrighed int
                                                                 .
                   objectSize:
                                                                    OBJECT_PART and a SUAPE_PART as the first two
   int ('setupClass) class.pl;
                                                                 .
                                                                    parts of the object.
                                                                11
IDELINE SHAPEL PART 1
   int Dimitralize (object_p);)
                                                                Lypedel utruct _shapeObject
   int ("deallocate((object_p)).)
       1*setvalue!(abject p.arg p. htl);)
                                                                   DEJECT PART
   int l'metvaluer(object_p.org_p.int);)
                                                                   SHAPE DART
   ent ('undater(object_p,object_p,window_p);)
                                                                  shapeObject_t.*shapeObject_p;
   int ("display/ object_p.window_p ):/
   the l'ensellobject p .window p 11
       (*highlight) (object p.Window p 1))
   170
                                                                 4
                                                                    define some convenience matros for acressing the parts
   int ("unhightight) object p, window p is"
                                                                    ganely
   Int L'inservitagi(object_p,wikdow_p 1:)
                                                                •7
   int lemovindcadi (
                     obyect_p,window_p.v
                     Gouble *, double * ); \
                                                                Mdeting gelöbjectClass(object)
                     onsect_p,window_p,double.double.s
double * ())
   int (*sizedras))
                                                                (ichiect) 7 (ichapeObject_p)(chiect))-uclass : MULL )
   int (frotatedrag) (object_p, window_b, double, double, )
                                                                1.0
                                                                    symbols defined by shapellass for method superitance
                     double *)
                                                                 .
   int ("move((object_p,double,double)))
                                                                    These are dumpy procedures. The procedure names are
   int ("recize((object_p,dcuble,double,double)))
                                                                    used as function pointers in the appropriate subtlais
   Lttr (*rotate(inbject_p,double,double,double); *
                                                                    method slot instead of a 'real' procedure. During
   double (*pointToChject)(abject_p.double.sy
int_)*excent)(abject_p.double *.double *.v
double *.double *.;
                                                                    class netup, shapellass checks for these symbols, and
                                                                    if they are found, they are replaced by the actual
                                                                    shapeClass function painter.
                                                                ÷ ()
1.4
 .
   Thus is the shape class structure definition.
                                                                extern shapellass t shapellass:
 .
   All clauses which are subclauses of shapeClass
   Will commist of CLASS_PART and SRAPEC_PART as
                                                                extern int inheritDisplay( object p.window p ):
 . the birst two parts of the class.
                                                                axtern int inheritErase( object_p.window_p );
                                                                extern int inherltHighlight) object_p.window_p 1;
47
                                                                extern int inherltUnhighlight/ object_p.window_p 17
typedei wriuer _shaper
                                                                extern int inheritimeeridrap/ object_p.window_p 1;
                                                                extern int innerifMovedrag| object_p.w.ndow_p.
Nouble*.Gouble* 1:
   CLASS_PART
   SWAPET HART
                                                                extern int inheritSizedrag( object_p.window_p.
 shapeCiass_t,*mapeCians_b;
                                                                                             double, double.
                                                                                             double", double* 1:
10
                                                                extern int inheritRotaledragi object_p,window_p.
   given an instance of a class_p, thuse macros will
 .
                                                                                               double.double.double* );
 .
                                                                extern int inheritRove: object_p.double.double i/
    access the swape class a the shape superclass
4.1
                                                                extern int inheritResite! object p. double. doubles
                                                                                           double; double is
sdetime getShapeClaus(class) )
                                                                extern int interstRetate! object p.double.double.double ),
(iclass) ? (shapeClass pi)(flans) : MIL)
                                                                extern dougin innerit Point ToObyect tobyect_p.
Adofine getSuperClass(class)
                                                                                                    double, double1:
(iclass) ? (ishupeClass_p)(class)) > superClass : MULL
                                                                extern int inheritExtent( object_p, nouble*, double*,
                                                                                           double* double* /:
24
 .
   This is the shape object definition. The class
                                                                Wendl: /* SHAPECLASSP_DEFS */
 ÷
   member is a 'hamile' to the object's class and
 .
    niethods:
                                                                                   lineClassP.h
                                                                 Listing Two
    The tirst member in any object to a pointer be
    the class attucture which contains the methods
    for the object.
                                                                       The SNAPS_RART convains members specific to all
    geometric shape objects.
                                                                    Listing 7. Private include file for lineClass.
   mink, miny, mask, maky and coordinates of the
 .
    boundany box for any object.
                                                                    lineClarsP h - lineClass estands shapePlass to ownlude
2.5
                                                                                   methods for linding, dragging, and
                                                                                   moving the individual permit is a
wdefine OBJECT_PART \
                                                                                   line.
   Class_p
               class: \
   void
               Thest:
                                                                                    The structure for line objects esteals
                                                                                   the shape object structure to incluso
Rdecine SHAPE PART
                                                                                   a pointer to the list of points in the
                  TOLING, WILLIAMS
  double
                                                                                    line object.
   Goutte
                  magy, magy:
                                                                    (c) Copyright 1991, Pornet W, Arnold
18
                                                                    All rights coverved.
```

(Listings 1-7 can be found on the AC's TECH Disk)

25

```
time delivers to freed of "overstading" the stap-
                                                                                                                                              A Minus - represent will then us added to the end of
Istabel LINECLASSI JEFS
                                                                                                                                                     the shore where in conserva-
theline LINECLASSF GEFS
                                                                                                                                              Ge ...
                                                                                                                                            1.1
finciede fainbailet. ....
fintlide "shapeniassfin"
#include fianeClass #5
                                                                                                                                                   andre_Wat
Line Diana Part line cin Adv. metrool for finding,
                                                                                                                                                   THE FIAT
 1
        dragation, and more the points
                                                                                                                                                 LANDING S. All medblock ga
- 1
                                                                                                                                             Contraction and the strend take a speed by
#define LINEC PART |
point_p ("tim Deint) (pb) ect_p, souble, shabi) (ison(h))'
                                                                                                                                            \approx 1
                (*drahumuc) (opletch) beinch winner o (
1.717
                                                                                                                                             RAP DE PRETARTANY (PRAN)
                 (*noverbint) (object_p.phint_p.unuble)(s)
175
                                                                                                                                             or approximation of provide a provid
14
  4
       The live man singurations 'sweltends' in these class
                                                                                                                                              ۰.
                                                                                                                                                    external demarations for suprisones of limitians.
                                                                                                                                                    expersion of class of the cities and internation
  * structure by adding LINFE_PART to the share class
                                                                                                                                              14
        structure.
                                                                                                                                                     Control (Line) Traced(Line)
67
                                                                                                                                             1.1
                                                                                                                                            when consider the fame
typeder struct line:
       TLASE_PADT
                                                                                                                                             Many next 2 March 161 Term Telepect 2 served.
      SHAPSE_PART
                                                                                                                                                                                                                   Monalla Xiddople Vi
      I INTE PAPE
                                                                                                                                                                                                                   monatio onà/:
    I.nm lang_1, "IINTIAN _!
                                                                                                                                             Harvo yth indexident/voint puller is onneer, point to point.
                                                                                                                                                                                                           NUMBER OF XILLION
10.00
                                                                                                                                                                                                           couple Mix, double +dyl;
* Line Object part - line nelects and a lineed list of
                                                                                                                                            HINLY INT HOLF ( Move out inbject, protect, point, product,
                                                                The points toposis the
  " pearts to shape object.
                                                                                                                                                                                                           would be double dyl:
        coordinates of the time.
 .
20
                                                                                                                                                              17 1 NET 11 - THIS
                                                                                                                                             A 81111
Adeline LINE RAR
POART_D POARES:
```



26 AC's TECHIM

Implementing an ARexx Interface in your C Program

By now, I am sure that many Amiga users have heard about ARexx and are well-aware of the capabilities of this macro language. I will not repeat the same information here. You will need some degree of familiarity with ARexx and a fairly good working knowledge of C to put the information presented in this article to good use. If you are not that familiar with ARexx or C, a study of those languages will help you understand this article better.

Misconceptions

Before I began working with ARexx, I had some misconceptions concerning implementing an ARexx interface in my own programs. I believe other programmers also have some of these misconceptions. The following paragraphs will cover some of these possible misconceptions.

At first, I thought that it would be too difficult to add an ARexx interface to a program I had written. That turned out to be false, but that was mostly because of my programming style. There are programming styles that are conducive to adding an ARexx interface and there are programming styles that make it quite laborious. Fam not suggesting that one style is correct and another style is incorrect—it is simply a matter of preference. However, when it comes to adding an ARexx interface, your programming style can save you programming time or increase it.

If you are a programmer that believes in the structured approach to programming, you should have little difficulty adding a ARexx interface to your programs. Structured programming uses separate functions to execute the subtasks that the program requires to perform its job. Each function is kept as small as possible to do its particular subtask. The structured programmer then includes calls to these functions within the C programming constructs such as the switch, if-else, do, while, and for statements. When adding an ARexx interface, it is just a matter of calling the proper function to perform the subtask required to fulfill the command requested by an ARexx message. This is the most efficient programming style when it comes to adding an ARexx interface. Some very good articles describing the structured programming approach to programming have been written by Paul Castonguay in previous AC TECH issues

The alternative to the structured programming approach is to include the code that executes each subtask within the C programming constructs mentioned earlier. Each case within a switch construct contains the code required to perform a particular subtask rather than calling a function, for example. If this type of programming is your style, you will need to add functions to your program to execute when you start receiving commands in the form of ARexx messages. Redundant programming results since most of the instructions contained in the switch statement are going to be almost exactly the same as in the functions you have to add to execute the ARexx command requests. This is the least efficient programming style when it comes to adding an ARexx interface.

So you see, the difficulty you experience in implementing an ARexx interface in your program has much to do with your style, or approach to programming. If you are considering writing a program in which you would like to include an ARexx interface, then you might want to consider using a structured approach to programming. You should write each command so that you call it in exactly the same manner whether the source of the request is from your ARexx interface or from any other source.

Another misconception some public domain and shareware programmers might have is that they don't need to put an ARexx interface in their programs because not too many Amiga owners have ARexx. Some time ago that might have been true, but consider this, when Amiga owners upgrade to AmigaDOS2.0, and almost every Amiga owner will inevitably want to, they will all have ARexx. Even now I suspect a large number of the Amiga owners have ARexx. If it were not so, the commercial software houses would not feel compelled to include ARexx interfaces in their programs. Public domain and shareware programs, some of which are every bit as good as their commercial counterparts, can also benefit from an ARexx interface. Imagine Amiga power users combining the use of your program with the commercial programs they have.

If you're concerned about the increase in the size of your program, you have no need to worry. Again, your style of programming determines this. If you write redundant code to implement each command your program can perform, your code size is going to increase much more than if you write functions that you can call from any location in your program. So, not only can your programming style determine the difficulty you are going to have including an ARexx interface, but it will also determine the size of the additional code you will need to write to have an ARexx interface in your program.

by David Blackwell

Reasons for an ARexx Interface

I have already touched on some of the reasons why you might want to add an ARexx interface. If you are a public domain or shareware programmer, you obviously want your program to be used and enjoyed. Anything you can add to your program that will increase its usefulness will ensure that it does get used. An ARexx interface does increase the utility of your program. Even if you're simply writing a program for your own personal need, an ARexx interface will enhance its usefulness. However, if you write a program for your own personal need that you get considerable use out of, I would suggest introducing it into the public domain or releasing it as shareware.

Consider how your program could perform when combined with a high quality commercial, public domain, or shareware program. You could write an ARexx macro program that would unify the two programs. You could easily switch between the programs in memory making it appear as one unified programming environment. Staggering possibilities flood my imagination.

This type of program integration may also save you programming time. You may want to write a program that modifies the output of another program to suit your specific needs. If both programs have an ARexx interface, you are all set. You can then concentrate your work on the code to perform the modification and let the other program handle the initial work.

Sure, you could also accomplish this without each program containing an ARexx interface. This would require you to run one program and perform the work you would run your own program to modify the output of the first program. That's not too much trouble. I guess, if you're used to that kind of juggling with your programs. However, I think that the idea of multi-tasking two or more programs under the control of a macro program is much nore attractive. Both programs could be working on the same data to produce the final output that you want. This is what most Amiga owners are used to This is the reason for a macro language like ARexx.

Another good reason for an ARexx interface is the control it gives the user over your program. Many software companies are going to great lengths in their advertising to inform Amiga owners. and potential software purchasers when their products contain an ARexy interface. I believe they realize that the potential to tailor their program to the user's specific needs is very attractive to the user. Whenever I look at a new software package to buy, one of the first things Hook for is an ARexx interface. I might not be able to make use of it right away, but I may eventually put it to good use. If you are producing a program with commercial or shareware potential, an ARexx interface may translate into monetary gains. If you are producing a program that you intend to release into the public domain. an ARexx interface may be just what you need to persuade people to try your program. Whether you are going for income or for the personal satisfaction of knowing that your program is being put to good use, an ARexx interface can help.

One final reason for an ARexx interface support for the ARexx language is continuing to grow. Recently I have seen two new products that expand the ARexx language as released by Bill Hawes. One is an object-oriented programming tool and the other is an ARexx compiler. With the growth of support will most likely come an increase in interest by common Aringa owners. Soon, for a software package to be successful. I believe that an ARese interface will be essential.

Programming the Interface

The following description of the steps required to add an interface will give you what you need to get started. The interface can be as simple or as complex as you want to to ake it. The more complex of an interface you want, however, the more programming you will do to implement it. I will give you the basics and then it is up to you to determine how far you want to go with them.

The very first thing you must do is open the revisive library through a call to the Exec's OpenLibrary function. You must put the return value from this function into a global variable named RexxSysBase. After you have opened the fibrary, you have access to all the ARexx system functions. I will not cover these functions since that would take too long, and they are all well covered in Appendix. C of the ARexx User's Reference Manual.

Getting a message port up and running should be your next priority. The easiest way to accomplish that is by using the Exec's CreatePort function (a complete description of this function can be found in the version 1.3 ROM Recent Reference Manual Libraries and Denies, page 281 or on page 8-5 of the version 1.2 Exec RKM). The CreatePort function will allocate all the necessary memory, add your port to the Exec's public port list, and allocates a signal bit for use with this message port. This message port can be considered the hub of your interface Command requests, information requests, and replies to messages you sent out will come through this message port. All of your interface is public port for any other ARexc host program or macro will go through this message port. Because this message port is vital to the execution of your interface, it is important that you keep up with its activity.

Most likely, your program will be receiving input from some source, and your program will probably be waiting for some event to occur before it can proceed with processing. This will most likely be in one form of the Walt function or another. Adding your port signal to the list of signals you are waiting on is simple and something you are probably already familiar with. If you are unfamiliar with the Walt function or how to set up to wait for multiple signals, you can refer to the main function of the Filer c source code (Listing Two), Toward the end of the main function, I set up the signals I am going to wait on, and then in the while loop that follows. I wait on certain signals to occur. After my program wakes up, I test the return value from the Walt function to determine which signal woke up my program.

The alternative to waiting on signals to wake up your program is to create a busy loop and check your message port periodically to see if there is a message waiting. However, this type of programming is not considered appropriate in a moltitasking operating system. This generally slows down the system and irrulates many users. Therefore, I recommend the first procedure.

When your program wakes up and you have determined that the signal you allocated for your AReix message port is the culprit, you need to get the new message and process it. Call the Exec's GetMsg function to get the address of the RexxMsg structure (Refer to Figure One for the RexxMsg structure definition i Now that you have the RexxMsg structure address you can determine what is being requested of your program.

"If you are producing a program with commercial or shareware potential, an ARexx interface may translate into monetary gains."

28

The request will be contained in the rm_Args[0] field, also known as ARG0, of the RexxMsg structure. This is the Ress Arg structure that contains the command name (your program name) and the arguments that go with it. (Refer to Figure Two for the RexxArg structure definition.) The value contained in ARG0 can be treated like a pointer to a C style nullterminated string since that is basically what it is All the fields in the RexxArg structure can be accessed at negative offsets from this pointer. However, this string is what contains all the information you are looking for. The first argument is the command name. You use this to determine which function to call. The remainder of the string should be parsed and sent to the function that executes the requested action. It is the information following the command name that you will need to extract from this string. All arguments are sent in string form. If you are expecting numeric arguments, you will need to use some of the C standard library functions to convert them to the format you require. There is a special condition that you need to be aware of. This occurs when the macroprogrammer requests that ARexy do the parsing for you.

Since you are just writing the host application and not every macro that could possibly call your program, you need to be aware that not every macro needs to call your program in exactly the same manner. To restrict the manner in which your program may be addressed by other programs is considered quite rude in some programming circles. What I am getting at is that a macro programmer can request that ARexx tokenize the command string prior to sending the RexxMsg structure to your program. The programmer does this by setting the RXFB_TOKEN command modifier flag bit in the rm_Action field of his or her RexxMsg structure. (Figure Three contains a complete listing of the Command modifier flag bits.) When ARexx receives a message structure with this bit set, it breaks up the ARG0 string into separate strings and creates a RexxArg structure for each one and places them in the rm_Args[0-15], ARG0-ARG15, helds in the order they appear in the command string. To correctly handle this situation, you need onlt to check the RXFB_TOKEN bit, and if it is set, get your arguments from the individual rm_Args[] fields and convert them as needed. To determine how many arguments the command string had, check the lowest nibble of the rm. Action field. This will be set to the number of arguments. If the command string has not been tokenized, then you will need to parse it as previously explained.

Once you have parsed the command and processed the request, you reply to the message. The important thing here is to report on the result of your processing so the program that sent the message can know what action to take. If all went well, set the rm_Result1 field to RC_OK, (See Figure Four for the ARexx return codes.) The rm_Result2 field is used to return a pointer to the result string if the RXFB_RESULT command modifier bit is set. The return string must be in the form of a RexxArg string. A result string should be returned only if requested and no errors occurred during you processing. If you were unsuccessful in your attempt to process the request, you set the rm_Result1 field with severity level of the error and the rm_Result2 field should be set to zero.



Not every message received at your message port is a request for some sort of action. With only one exception, if you send any messages to the ARexx resident process, you can expect to eventually receive reply messages. When these replies start rolling in, you need to be able to distinguish between them and requests for information or command requests. This is a fairly straightforward procedure. You check to see if the message you just retrieved is the type NT_REPLYMSG. This will be in the UBYTE In_Type field in the rm_Node message structure in your RexxMsg message structure. The test could look like this:

17 INVNoulage-stm_Node.cm_Node.in_Type -- NT_REFLYMRG)

When you do determine that it is a reply message, check for possible error conditions and handle any that appear. If all went well and you requested a return string, you need to extract the return string, delete any RexxArg's and then delete the RexxMsg itself. If you did receive a return string, you are responsible to delete this RexxArg structure when you are done with it

Another way to distinguish between requests and replies is to set up a separate message port for replies only. Put the address of this message port in the mn_ReplyPort field of the RexxMsg message structure

MyMossage-arm_Node.nu_PaplyPort : MyReplyPort:

Now, when the message returns to you it will come back to your reply port, and you can have a customized function to handle all reply messages received at this port. Your other ARexx message port will only receive requests of one kind or another and can have its own function to send off those request to your program. The way you handle your message traffic is up to you. Each way has its pros and cons.

Earlier I referred to the fact that some messages you send out may not come back in the form of a reply message. If you set the RXFB_NONRET command modifier flag bit in the RexxMsg. rm_Action field, you will never hear from that message again. Maybe that is a good idea. What happens, however, if the action you requested is not successfully completed? You may never know, Live on the edge; try it.

So far I have just written about commands received from other programs instructing your program on what to do. However, you can direct other programs through your ARexx interface also You can get ARexx macros running. You can run other host applications. You can exchange information with other host applications. You can even combine these possibilities in new and imaginative ways. All of your communications with exterior programs, however, should go through the ARexx resident process. That requires you to get an ARexx message put together with the proper initialization of the fields that are required to get the message to the proper destination.

The first thing you have to do, of course, is allocate some memory for the RexxMsg structure. I generally request that the memory be cleared as it is allocated (ex., MyRexxMsg = AllocMem(sizeof(struct RexxMsg), MEMF_CLEAR)). This has the effect of initializing all the unused RexxMsg fields for you. All you have to do then is set up the fields you are using. The rm_Action field is extremely important. This is the action code (command) you are sending to ARexx. There are a number of these action codes, but we will focus on the command-level invocation code (RXCOMM). As previously covered, there are some command modifier flag bits that can be set in the rm_Action field to further tailor the action code. These command modifier flag bits can be combined to finely tweak. the command execution. However, setting the RXFB_NONRET and the RXFB_RESULT bits at the same time may have some serious side effects. The first bit instructs ARexx not to return the message to you and the second bit requests that a result string be returned in the message structure that you just requested not be returned. (What a paradox for ARexx-I am not exactly sure what would happen.) Next you place your message port's address in the MN_REPLYPORT and rm_PassPort fields of your message structure. Then you put the pointer to your message port's name in the MN_NAME and the rm_CommAddr fields. Optionally, you can supply a file extension for ARexx to use when looking for the command name you sent to be executed by placing a pointer to a file extension string in the rm_FileExt field, and you can send your program's default input and output filehandles by placing them in the rm_Stdin and rm_Stdout fields respectively.

As described, the task of implementing an ARexx interface seems quite imposing. There are quit a few minor details that must be attended to. The task is simple enough, but allocating and releasing memory for ARexx messages and argstrings can take its toll. Creating a message port for your interface to use, monitoring the message port's activity, parsing the command strings, distinguishing between command requests and reply messages, all the tasks associated with sending a command to ARexx and finally deleting your message port when you are done with it can be a nuisance. Don't get me wrong, an ARexx interface is worth all you go through to have it. On the other hand, if most of the tedious work was done for you, wouldn't you want to take advantage of that?

Rexxapp.library Answers the Call

That is exactly what Jeff Glatt of Dissidents Software has done. He has put together a library of functions that will take care of all the mundane tasks associated with an ARexx interface. This is the rexxapp.library.

This library automatically handles all of the message traffic associated with your ARexx message port. It accepts asynchronous ARexx messages and sends both synchronous and asynchronous messages to ARexx on behalf of your program. This means that you can control other programs or be controlled by other programs through this library.

The rexxipp.library allocates and frees the memory for all the ARexx structures it uses. You no longer work directly with the ARexx resident process. You don't have to supply the routines to handle a message port. You give the library a message port name, and it opens the message port. The library creates all the ARexx messages and sends them out at your request. It also distinguishes between commands received and replies to messages you sent out. It can even call separate routines based on whether a reply message returns a result string or an error condition. All this processing power is packed into just seven functions.

This limited number of functions means that with very little programming you can have an ARexx interface. To take advantage of the library, first set up the RexxData structure defined by Jeff Glatt for use by the library. (See Figure Five for the RexxData structure.)

RexxData Structure

The RexxData structure is a required argument for every function in the library. It is a variable length structure. The size of the structure varies with the number of commands your program recognizes. You supply the number of commands in the NUMCMDS variable in your header file. This variable must be defined before you declare the RexxData structure type. You must initialize the Exten. Func, Error, Result and AsscList[] fields of your RexxData structure before you can use it.

The Exten field holds a pointer to the null-terminated string to use as the filename extension to affix to commands received by the library that are not in your associated command list. This situation can happen if the ARexx address command, followed by your port name, precedes a command the ARexx interpreter does not understand. The ARexx interpreter will package this command up as an argstring, place a pointer to this argstring in the ARG0 field of a RexxMsg structure and send this message to your program for processing. If this command is actually the name of an ARexx macro, and not an internal command of your program, the library adds the filename extension to it and sends the message back to the ARexy resident process as a command invocation request. ARexs, will then run the macro for your. With this feature, you can use ARexx macros in the same fashion as internal commands. If you don't really want an extension but you would like to take advantage of this feature, put a pointer to a nulled string in this field. The library will pass the command on to ARexy exactly as received. By placing a zero in this field you turn this leature off. That means that when the library encounters a message sent to your message port, that does not contain a command in your associated command list, it will be returned to ARexx with an error value of 30 in the rm. Result1 field

The Func, Error and Result fields hold pointers to functions. You write these functions, and the fibrary calls them to handle certain situations. Writing these three functions is probably the most work you will do in setting up your interface using the reccapp library.

The Func field holds a pointer to the function you want the library to call when a message arrives at your message port that has a command in the argstring that is also found in your associated command list. Dispatch is the name of my function. The library calls this function only when your program calls the ReceiveRexk library function (more on the ReceiveRexx function later). The dispatch function receives four arguments: a pointer to the message that prompted the call, the pointer to the function to call to execute the requested command, a pointer to the argstring stripped of the command name, and a pointer to your RexxData structure. This function should set up any arguments or variables that the requested function needs and then calls the function. When the function you called returns, you need to set up the result fields using the message pointer you received in your dispatch function's first argument. The result fields are set up differently depending on whether the command was executed successfully or not. The library's SetupResults function gives you a convenient way to set up the result helds (again, more on the Setup Results function later). After your dispatch function is done. you return either a one or a zero. A return value of one tells the library to reply to the message. A return value of zero tells the fibrary that your program is going to reply to the message. Unless you absolutely need to hold onto the message for some reason, you should let the library reply to the message. One side effect of holding onto the message is that the ARexy script that sent the message is suspended. put to sleep in other words, until you reply to the message.

The Error field holds a pointer to the function for the library to call whenever any message that your program sends out returns with an error. Most likely this function will just print the error message to the screen, in one manner or another, to let the user know that an error occurred. If you don't want to do anything with error returns, you must still provide a dummy routine. Your error function receives four arguments: the error code, a pointer to the error string, a pointer to the message that returned with an error and a pointer to your RexxData structure. Do not alter the error string.

The Result field holds a pointer to the function for the fibrary tocall whenever any message your program sends out returns after a successful completion. What your functions does with the result string depends on which function in your program sent the



Circle 101 on Reader Service card.

message in the first place. If you never request a result string to be returned, you still need to provide a dummy routine. Your result function receives four arguments: the result code, a pointer to the result string, a pointer to the message that has returned and a pointer to your RexxData structure. Do not alter the result string.

You can find the prototypes to my functions in Listing One, my header file, and you can see the actual code in Listing Two, my source code. The names of my functions are: dispatch, error_rtn and process_rtn. In this article, my dispatch routine is a scaled down routine. In Part Two of this article, I will add more to this routine to make it a little more useful. My error routine, error_rtn, simply displays an autorequester to the window to inform the user what has happened. My return function, process_rtn, is just a dummy routine in this program. I never request a result string: However, in the completed program that will accompany Part Two of this article, this routine may change it needed.

The last field you initialize in the RexxData structure is the AsseLast[] field. This is an array of CmdEntry structures. Each command entry structure contains a name string of a command your program recognizes and a pointer to the function that is associated with this command string. The variable NUMCMDS defines the number of commands in your list. The last entry in the list must be a NULL entry so the NUMCMDS variable must actually equal the number of commands your program recognizes, plus one. All the commands must be in lower-case letters with no imbedded spaces. The library does not require the complete command string in order to match a command request to the command list entry. If one of your commands in your list is open, then the string ope will also result in a match. Be sure to make all of your command names unique. Any command of yours that matches an ARexx instruction will be sent to the ARexx interpreter instead of to your program.

Now let's go over the functions available for you to use us the library. There are only seven functions to cover. SetRexxPort. ReceiveRexx. SetupResults. FreeRexxPort. SendRexxCmd. SyncRexxCmd and ASyncRexxCmd.

SetRexxPort

The SetRexcPort function must be called first. This function does all your interface set up. You pass it a pointer to your port name and a pointer to your RexxData structure. This function returns a signal bit mask assigned to your message port. You can use this mask in the Exec Wait function to wait for activity at this message port. The port name string buffer should be one byto larger than the actual name. This function appends a number between 2-9 on the end of your portname to resolve any conflicts with portnames already used. The library can support only up to nine copies of your program running at once. This function will initialize the remaining fields in your RexxData structure. You call this function only once. This function returns a zero if it was unsuccessful. Once you have successful set up, you are ready to continue.

ReceiveRexx

The ReceiveRexx function is the workhorse of the library When a message arrives at your message port, your program is awakened by a return from the Wait function. When you test the return value and determine that the signal from your ARexx message port caused your program to become active, you call the ReceiveRexx function. The ReceiveRexy function takes care of all the messages waiting at your message port. It can tell the difference between commands received from other programs and replies to messages you initiated. If the message is a command, ReceiveRexx will call your dispatch function. If the message is a reply, ReceiveRexx checks the rm_Result1 field of the message structure to see if the request was executed successfully. ReceiveRess calls your result function if everything went well; otherwise, it calls your error hunction. This function frees the memory used by messages you sent out and replies to all messages that your message port receives. The only time it will not reply to a message is if your dispatch function returns a zero. Before your dispatch function returns, however, it should have called the SetupResits function.

SetupResults

The SetupResults function is used by you to communicate to the initiating program whether its request was successfully completed. You provide a primary result value, a secondary result value a pointer to a return string, a pointer to the message structure that caused the action and a pointer to your RexxData structure. If the request was successful, pass a zero as both the primary and secondary result values, and you pass a pointer to a result string if the RXFB_RESULT command modifier bits set. If the RXFB_RESULT bit is not set or you don't have a string to return, you supply a NULL as a result string pointer. You return the pointer to the message structure that ReceiveRexx supplied. You return error values fitting the error severity level in both the primary and secondary result values and a NULL as the result string pointer if you did not successfully complete the request. This function does not return a value.

FreeRexxPort

The FreeRexxPort function provides a clean exit for your ARexx interface. Once you have executed the SetRexxPort function it is absolutely necessary to execute this function when your program is done. This functions takes a lot of work off your hands: it replies to any messages remaining in your queue, it closes your ARexx message port, it frees any resources it used, and it closes the ARexx system library. If any of the messages you sent have not returned yet, this function will not return until every one of them is accounted for

Communication Routines

The next three library functions handle communications with ARexy. Two of these functions are high level functions; one synchronous and one asynchronous. You pass fewer arguments to the higher level functions, therefore, they are easter to use. You will most likely get the most use out of the higher level functions. The one low-level function is used when you need the maximum control of the communication process that is possible with the library. You pass twice as many arguments to the lower-level function as compared to the higher level functions. The main attraction of the lower-level communication function is that you have a chance to manipulate the RexxMsg structure before it is sent, and you get the first look at it when it returns. The document file that is included with the library alludes to the fact that this function is both synchronous and asynchronous. During my testing, I was unable to get it to function synchronously. I am continuing to try to work this problem, because there are definitely times when you want to wait for your request to finish executing before you continue with your processing.

SyncRexxCmd and ASyncRexxCmd

SyncRexxCmd and ASyncRexxCmd are the tugher level functions for synchronous and asynchronous communications respectively. Other than the basic difference between synchronous and asynchronous communications, these functions are very sunilar. The SyncRexxCmd function requires three arguments: a pointer to the command string, a pointer to the message structure that crused the action, and a pointer to your RexyData structure. The ASyncRexxCmd function requires only the command string pointer and the pointer to your RessData structure as arguments. Both hunctions return a pointer to the message structure it created to communicate with AReo, However, if either function cannot successfully fulfill your request, it returns a zero value, and it places a pointer to a nullterminated error message in the global variable RexxErrMsg. Another difference in operation is that the SyncRexxCmd function replies to the message that you passed the pointer for. These functions are mainly provided for ease of use rather than the maximum amount of control of the communication process.

SendRexxCmd

The SendRexxCmd function, as the lowest-level communication function of the library, gives you the most control over the communication process. Unlike the previous two functions where the most control you had was to send a command string, with the SendRexxCmd function, you provide the value for the rm_Action field of the message structure, a pointer to a message initialization function, a pointer to a command string, a pointer to a returned message function, a pointer to the message that caused this action, and a pointer to your RexxData structure. Lisbing One contains the prototype for the SendRexxCmd function. The most promising possubilities come from the two function pointers you provide.

32

Should You?

Amaze Them Every Month!

Amazing Computing For The Commodore Amiga is dedicated to Amiga users who want to do more with their Amigas. From Amiga beginners to advanced Amiga hardware hackers, AC consistently offers articles, reviews, hints, and insights into the expanding capabilities of the Amiga. Amazing Computing is always in touch with the latest new products and new achievements for the Commodore Amiga. Whether it is an interest in Video production, programming, business, productivity, or just great games, AC presents the finest the Amiga has to offer. For exciting Amiga information in a clear and informative style, there is no better value than Amazing Computing.

A Guide For Every Amiga User.

Give the Amiga user on your gift list even more information with a SuperSub containing Amazing Computing and the world famous AC's GUIDE To The Commodore Amiga, AC's GUIDE (published twice each year) is a complete listing of every piece of hardware and software available for the Amiga. This vast reference to the Commodore Amiga is divided and cross referenced to provide accurate and immediate information on every product for the Amiga. Aside from the thousands of hardware and software products available, AC's GUIDE also contains a thorough list and index to the complete Fred Fish Collection as well as hundreds of other freely redistributable software programs. No Amiga library should be without the latest AC's GUIDE.

More TECH!

AC's TECH For The Commodore Amiga is an Amiga users ultimate technical magazine. AC's TECH carries programming and hardware techniques too large or involved to fit in Amazing Computing. Each quarterly issue comes complete with a companion disk and is a must for Amiga users who are seriously involved in understanding how the Amiga works. With hardware projects such as creating your own grey scale digitizer and software tutorials such as producing a ray tracing program, AC's TECH is the publication for readers to harness their Amiga to fulfill their dreams.

To order phone 1-800-345-3360

(in the U.S. or Canada) Foreign orders: 1-508-678-4200 or

FAX 1-508-675-6002.

or USE THE CONVENIENT ATTACHED CARD MAIL TO: Amazing Computing

P.O. Box 2140 Fall River, MA 02722-0869 YES! The "Amazing" AC publications give me 3 GREAT reasons to save! Please begin the subscription(s) indicated below immediately!

AU. TED IL AMIGA

City	State 21	P
Charge my Visa	MC #	VIS
Expiration Date	Signature	Canada
Ploa	se circle to indicate this is a New Subscription or a	Renewal
1 year of AC	12 big issues of Amazing Computing! Save over 49% off the cover price!	US \$29.95 Canada/Mexico \$38.95 Foreign Surface \$49.97
1-year SuperSub	AC + AC's GUIDE - 14 issues total! Save more than 45% off the cover prices!	US \$36.00 Canada/Mexico \$54.00 Foreign Surface \$64.00
2 years of AC	24 big issues! Save over 59%! US only.	US \$43.95
2-year SuperSub	28 big issues! Save more than 56%! US only.	US \$59.00
1 year of AC's TECH	4 big issues! Limited time offer - US only!	US \$44.95

Check or money order payments must be in US funds drawn on a US bank; subject to applicable sales tax

You can use the first function to modify or initialize any field in the message structure before it is sent out. The SendRexxCmd function performs a default initialization before passing the message structure to your routine. Of particular interest to us are the ARG1-ARG13, rm_PassPort, rm_CommAddr, Stdin and Stdout fields.

The SendRexxCmd function initializes the ARG0 field with the pointer to the command string you passed as your third argument in the function call, and it uses ARG14 and ARG15 for its own purposes. This leaves you the ARG1-ARG13 fields to use however you see fit. You can use these fields to pass additional argstrings, C style terminated strings, numeric values, or any other value that you can fit into a STRIPTR (long) data type. However, you are responsible to free any memory allocated to pass argstrings or C style null terminated strings. You can free this memory in your error and result routines described earlier or in the returned message function for which you pass a pointer to the SendRexxCmd function. It is important to remember that if you use some of the ARG1-ARG13 fields to pass values other than argstrings, the program that receives the message must be prepared to process those values. This eliminates ARexx macros because they expect argstrings only.

Therm_PassPort field holds a message port address. A Reac will parse the ARG0 value to extract the command name. A Reax will then search for a program by that name. If the program is not found, A Reax will pass the message to the message port address in the rm_PassPort field. The command name in ARG0 may not be a program name at all but a command that the other program, whose message port address you put in rm_PassPort, recognizes. This provides a conventient way for you to pass commands to another program using the A Reax resident process as an intermediary. If this field is a NULL and A Reax can not find the program, then A Reax returns the message with a "Program not found" error message

The rm_CommAddr field on the other hand provides a way to override the default initial host address. This is a null-terminated string and is "REXX" by default. The ARexx User's Reference Manual states, "The host address is the name of the message port to which commands will be directed" You can redirect that command message traffic by supplying your message port name as the default address. The macros you run with your message port name as the default host address no longer need to execute the ARexy address instruction to direct commands to your program. They come to your program automatically now. This is convenient if your program supports multiple instances of itself. Each instance of your program will have a unique message port name. This message port name will be used as the default host address by each instance. That allows each instance of your program to run exactly the same macros, and the commands issued by those macros will be routed automatically to the correct instance of your program by use of the default host address value. Still a little vague? I will try to clarify it further with an example.

```
Ambain Raryo

/* reprized akeys comment *:

's user is command for your pronoun *

easy
```

That macro is easy enough to understand. First it prints a missage alerting the user that it is running, sends a save command and then quits. Without the ARexx address command, the save command is sent directly to the ARexx resident process because the default host address is "REXX". If this macro is executed with your host address name supplied as the default, the save command would be sent directly to your program. With multiple instances of your program running, each with unique host address names, the save command will be sent to the proper instance of your program by use of the default host address name when they execute this macro. Using this feature allows you to write macros that can be used by any program that supplies the proper default host address, and multiple programs can execute these macros simultaneously.

The last two fields of interest, rm_Stdin and rm_Stdout, allow you to redirect the input and output streams. If your program, for one reason or another, has no default input and output streams, it will be necessary for you to supply values for these fields if your macro prints any information to the screen or prompts the user for any information.

The second function you supply to the SendRexxCmd function gets the first look at the message structure when it returns. You can use this routine to extract any special values you expect to be returned. You may also need to tree some memory used by argstrings you sent. This function can also be called after a fatal error, so it is important to test return values before using them to ensure that they are safe to use. This function is passed a pointer to the RexxMsg you sent out, the rm_Result1 value and the rm_Result2 value. The document file that comes with the library says that if no routine is supplied then the SendRexxCmd function executes asynchronously. Therefore, Lassume that if a routine is supplied, the SendRexxCmd function executes synchronously. However, even when I supplied a routine, the SendRexxCmd function continued to execute asynchronously. I am continuing to test this function.

Conclusion

Well, that is a fairly detailed description of the the rexxapp.library written by Jeff Glatt of Dissidents Software. The program included with this article is a completely functioning program with just a shell of an ARexx interface. In Part Two of this article we will complete the interface. As the program is, it is completely useless except as a good test bed to explore the operation of the rexxapp.library. If you are ingenious, you can modify it a little to test every function in the library. I have done that myself. The completed program will be a program that you can get some use out of

If you examine the source code in Listing Two, you will get a better idea of some of the material I presented in my description of the rexxapp.library. Because it is just an interface shell rather than a fully functioning interface, the RexxData structure includes only the commands available in the program's project menu.

When we complete the interface, we will give it access to more commands, some of which are available only through the ARexy interface. For some of the commands, we can write ARexy. macros to execute them to reduce the size of the memory-resident host application. I encourage you to take a close look at the program. to see what potential it has for you. This program is intended to be runrung in the background at all times for quick access to information stored in small database type files. You access it through the Alt-Ctrlfkey combination, pull up the information that your are looking for, and then put the program back to sleep until you need it again. All it needs to teach this goal is more file access commands and some display commands so you can see what is in the files. This is what we will be adding in the next part of the article. If you think you could get some use from a program like this, you can send me suggestions and ideas for commands you would like to see included in it. You can leave me a message on GEnie using the e-mail address, D.Blackwell1.
Listing One	Filerh	1 Sta Man (1997) and
the second s		BALL CONT. LINE AND AND
Care a		12 - 4 M - 4 - 27
T many tills live the	Vilation and the first stand in furthers that it	
· with forgoid start	the proof of the state of the state	The second se
1.1		End of the second of the secon
and approximate and		
the cost with a loss		BYL I GAL THE ANTIPUT DIA RATES AT
3		and a feature of the party sector of the sec
Val de attra ta		200 sectors with a Summarian
A commence of the local days in the		The second se
at the same month of	5 C	and a second
I made over oversion	10 C	the second se
Automatic and an and the		
Accessible without the second	and the second se	the second the second sec
Trends -cost fields	11 mm	(1) (The second of the second
Forching and contribution		Front and the second second port of the second
Arrest market woman	and the second	and the second sec
(T)(HI)(I		a service of the serv
And up many million		the state of the s
and a free role and		And an an an and an
KEY/Dur HERR KRY 1/2		As used in Country Aurora 10, and 11400 pro-
ADD A ADDATE API 1		
The two periods		Listing Two Filer c
ABLACK HALLS		and the second sec
A50 [10.872] 107		= (1, 02, -2)
Balling The State		17 MOR 8 100 FLOSE 1
ARTICLE INTERNAL IN		the first state between sold
ASSUME WARRANT		
\$54/14 80002/9046 *12	are the state of a state of	A second s
And the sub-Cop For		ter and the second seco
ASILISI KORNEY #E		NAME OF TAXABLE AND A DESCRIPTION OF TAXABLE
sort in ration 11		where the second second second second
ADVIO TOLIN IN		artist and the second s
Adding Politocope 13	sub-treatment of Act frontient gains, as soo	The second se
And in TYPEPULATING	WHEN THE WEITHER HER BRETHER	ment and an of the sufficient of the property of the
Mint in motions of	Contractioner Acceptor	and the second sec
Karrisa Weinkargage	THE REAL POLYMER HERE AND ADDRESS TO THE CONC. AND THE REAL	in a second to the second seco
14 (782198) (00)	00.17.88)	and the second sec
a Court Charles Co		The second state of the second state and state
	Con Sold in the	the second store there is not the factor that the second store the
		the second
		1000 1002290 (* 2000 1000 *
During Brindshill	Linut Bedern Internet	and the set of the set of the set of
	The Million,	and the second se
	Outre & area	Free Los Spiritor - Vice
	stelle tolk) t toleo.je	and the second se
	And South	and the second sec
	Total Manmar	tion the sector of prime of the value of the sector
	Tubbi Hettura	
	when regard that a mail	211 12 19600814 (#NO.)
all sur- on the styres of		Server (1974)
	African, Node an Prederi	
	The state	ACCE DO NO. DO
	a this down in A.	
		14
1 Territoria	12	1 "100" (101") (101") (101") (101")
	T ROUGHS TO RECEIPT DEPENDENT TO	
nd L. Lianten it		
Terest and the		((m)) (
Course on a property of the second	De Tre	
prick openant from the days	an of disc	the part of a standard state and
and the second s	at heading the	PL-similar out, Epropei
-OTA THE R. R. RANKING CO. D.	T WORKER TO	to be set of the set o
and fundaments are	Contract a contract of the con	and the second se
and the second s	Sar 1, 12 year Internet 1, 11 / 11 Moornet 1 / 1	All such that and the board much sense and the
 A strategy of the second second	The Association of the second se	Arrived and the second methods and the a
$\begin{array}{c} & = 1 & 0 & 0 & 0 & 0 & 0 \\ & = 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ & = 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ & = 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ & = 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ & = 1 & 0 & 0 & 0 & 0 & 0 \\ & = 1 & 0 & 0 & 0 & 0 & 0 \end{array}$	(a) and a second state of the second state	 A transmission of the second system of
 A. S. S.	(a) An Ali and Ali	An international state of the second system in the second system in the second system is a second system in the second system in the second system is a second system in the second system is a second system in the second system is a second system in the second system in the second system is a second system in the
	(a) A start from the start start start of the start of the start st start start s	 A strain from the set of the se
$\label{eq:constraints} \begin{split} & \mathcal{L}_{1} = \mathcal{L}$	<pre>Set 2, If us more 1, if u</pre>	 A to place the place of the control of
 The Article and States The Article and S	<pre>Section 2</pre>	 A Ling Mark Control and Contr
 A second construction of the second se	<pre>Text 1 to second 1. () if to second 1.() Text 1, super typesty 4. () if to second if () Text 1. super typesty 4. () if the second if () if () Text 1. () if the second if () if () if () if () Text 1. () if () if () if () if () if () if () if () if () if</pre>	For pairs the grant of the formation of the second seco
	<pre>The second of the second second</pre>	 A transfer of the distance of the second structure of the second structure of the distance of the second structure of the second structur
	<pre>interact of the second state of the second state field is accessible the second state of the second s</pre>	 A strain from the set of the se
	<pre>Section 2 = Section 2 = S</pre>	For the South S

The second second

and the second the second second second

and a second sec

in head and the head and the story of the second of

- 1 0400 PM - HIRDON TART - CAME AND TALL

which is an equivalent to the transition of the

2.2.1 In production between the second classification from the activity of the physical contract production of the second contract of

The second state of the se

Theory of the local division of the local di

AND DESCRIPTION OF

HOLE AND ADDRESS

Climeter .

. The set of the set And Strength and the strength of the Strength of the

Dest. And and

IN THE OWNER OF Pres 100 and a later

Carried Street

and a second sec 2480

Column 1

the second se

And the second s -----

-The second se

> 1 million for the other Listing in status

AC's TECHTM 36

```
and a - -
```

STATISTICS. Commenting and stores.

departs. A passed optimum

1001024

Property and the second second

and included in

(1-j)(1-j)(1-j) = (j-j)(1-j)(1-j)(1-j)

The second secon

 $\begin{array}{c} y = -\pi \left(x + y + y + y \right) + \pi \left(-\pi \right) \\ y = \pi \left(x + y \right) + \pi \left(-\pi \right) + \pi \left(-\pi \right) \\ z = \pi \left(x + y + y \right) + \pi \left(-\pi \right) + \pi \left(-\pi \right) \\ z = \pi \left(x + y + y \right) + \pi \left(-\pi \right) \\ z = \pi \left(x + y + y + y \right) + \pi \left(-\pi \right) + \pi \left$

In these second records with a loss

 $\frac{1}{2} \left(\frac{1}{2} + \frac{1$

president and the state of the second state of

. The set of the set

 $\frac{(1+1)^{2}}{(1+1)^{2}} = \frac{(1+1)^{2}}{(1+1)^{2}} = \frac{(1+1)^{2}}{(1+$

and the second s And the second s

The states

Contraction of the second seco

L. OPERATE AND Sector and States Sectors

 $\begin{array}{c} (1-1)^{2} \left(\left(\frac{1}{2} \right)^{2} \left(\frac{1}{2} \right)^{2} \right) \\ & = \left(\left(\frac{1}{2} \right)^{2} \left(\left(\frac{1}{2} \right)^{2} \left(\frac{1}{2} \right$

man indicate and the

statement with some 1 in property And some factors in these is

I DOWN TO DESIGN A DOWN TO DOWN TO DO

the second s

Section 1. Constant

"Contraction of the second second Distant Anna Barris

 $\begin{array}{cccc} (1-1) & (1-1$

(1) S. S. Sandar, S. S. S. S. S. Sandar, and S. S. Sandar, Sandar, Sandar, Sandar, Sandar, Sandar, Sandar, Sandar

 $\frac{1}{2} \frac{1}{2} \frac{1}$ and strength in

the state of the state of the

-

" and its present is traced built of and the large (

The production of a feature of a second secon

The medical state

 $(h_{1}) = \sum_{\substack{i \in \mathcal{I}_{1} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_{1}) = \sum_{\substack{i \in \mathcal{I}_{2} \\ i \in \mathcal{I}_{2}}} (h_$

the second se

the second secon

the set of the set of

- (in the second second

Contract of Section Section 1994

Vol. 2, Num. 1 ©1991

the want twee share THE OWNER with solid to the second second string where and the second s And the state of the local division of the l No. of Concession, Name Same 1 real Transferra Transferra Transferra in. - Camponer 1 - Literature 1000 - Carpone 1000 (The Real of Street of Streeto Algert Support to and a list to an it. start Same County and some Group 1 Defined Service ACCOUNT OF A DESCRIPTION OF A DESCRIPTIO -----1.0 art could get the THE REAL PROPERTY. 1.000 -----the experimental sector sector in the sec-1-1-5-6 A Company of Company

11 A. 12 March 10 - 1 $\frac{-1}{2} \frac{1}{2} \frac{1$ ALC: NUMBER OF STREET, for the start of the local distance of the start of the s and the second special second LINE MORTHON (1) I such and a sub-total maps higher by I have spatial sub-TO R. MARCO Care Contraction 2014 Light (generated at 1) 01 Law ellection in Spec The second secon STREE!
$$\label{eq:states} \begin{split} & \mathbf{r}^{(1)} = \mathbf{r}^{(1)} + \mathbf{r}^{(1)} \mathbf{r}^{(1)} + \mathbf{r}^{(1)} \mathbf{r}^{(1)} \mathbf{r}^{(1)} + \mathbf{r}^{(1)} \mathbf$$
 $\begin{array}{l} \begin{array}{l} 1 & 1 & \text{started} & 1 & \text{started} & \text{started} & 1 & \text{star$ land the second Citigations a state of the second s rendra de da cortanida en en este $\begin{array}{c} (1,1) = (1,1)$ and the second sec C. LEWIS AND 1 Constant No. 1000 LAR CONTRACT the second second the function of the set of the se international design of the second se

a superior of

- Sherry

the second second

the second se

Section 101 (Section 40)
 Section 101 (Section 40)
 Section 101 (Section 40)

surgery through the setting of the set

CONTRACTOR AND ADDRESS OF ADDRESS OF ADDRESS A

and the state 0.000

Considered and the second second

been active. Control attached 1 bit will fee 5

and the second

- -----

A second second case of

- - 0-

the second second

Annual Annual Annual Contraction (

The second secon

second of the second se and provide a second second second

the second second second

the proof of the A second and a second s

1.111000011

O. STREET,

and the second s

17 June 1000 Million Million

Contraction of Table 1 (1997)

and the second second

12 cm line was a furnished by

100,000 -1100

 $\sum_{i=1}^{n} \frac{1}{i} \sum_{i=1}^{n} \frac{1}{i} \sum_{i$

i se sta se se

 The second second	
(* challenthal)	
Alama - 2 ⁻¹ - 2 ⁻¹ - 2 ⁻¹ - 2 ⁻¹	
 All Agentication and particular contractions and particular contractions	



For more information on advanced ARexx topics, see:

An Introduction to IPC with ARexx by Dan Sugalski (AC's TECH Volume 1, Number 1) Interfacing Assembly Language Applications to ARexx by Jeff Glatt (AC's TECH Volume 1, Number 2) Intuition and Graphics in ARexx Scripts by Jeff Glatt (AC's TECH Volume 1, Number 2) C Macros for ARexx? by David Blackwell (AC's TECH Volume 1, Number 3) GPIO—Low-Cost Sequence Control by Ken Hall (AC's TECH Volume 1, Number 4) Programming with the ARexxDB RecordsManager by Benton Jackson (AC's TECH Volume 1, Number 4) STOX—An ARexx-based System for Maintaining Stock Prices by Jack Fox (AC's TECH Volume 1, Number 4)

Back Issues available while supplies last! Call NOW! 1-800-345-3360

The Amiga and the MIDI Hardware Specification



CAUTION: Be care ful when attempting to build and connect hard ware projects to your computer. Always check you work twice before attaching the project to your computer. Attaching a home-built project to your computer may void your warranty. PiM Publications, Inc. its agents, or the author, is not responsible for any resulting damages, from the use or misuse of this project. As always, use common sense:

A revolution began in 1983 when several electronic musical instrument manufacturers joined to publish a standard describing a system of communication between music synthesizers. The Musical Instrument Digital Interface or MIDI is now available on almost all electronic musical instruments. MIDI allows synthesizers, sequencers, rhythm machines, and effects boxes to control one another and has greatly expanded the role computers now play in music. With right software, an Amiga connected to a MIDI instrument can record and play back a performance, edit and print a musical score, act as a synthesizer patch editor and librarian, and even teach you how to play!

MIDI is a digital serial communication specification that consists of a physical standard which describes the type of connector and cable to interconnect MIDI devices, a hardware standard that specifies the design of the electrical interface and a software standard which establishes the type and format of MIDI messages. MIDI has become such an important communication system that some models of the Macintosh and Atari have MIDI ports built-in.

While this is not intended to be a do-it-yourself construction guide to building a MIDI interface, with some degree of technical skill and the information in this article, you'll find it quite easy to put one together. Be aware that you bear complete responsibility for any damage caused by the design and construction of such an interface based on information presented in this article. Unlike an annoying program bug, an error in your design could cause severe damage to your computer and any connected MIDI device. Repair technicians are notably unsympathetic about hardware hackers' mistakes and are apt to charge accordingly. It goes without saying that the addition of any home brew circuit effectively voids the manufacturer's warranty. Proceed cautiously!

by James Cook

Learn the ins and outs of the mysterious MIDI Hardware Specification... and build your own MIDI Interface!

The Physical Specification

The typical MIDI compatible device usually has three 5-pin female DIN ports. The MIDLIN port receives transmissions from other devices, the MIDI OUT port transmits data to other devices and the MIDI THRU port acts as a MIDI OUT for all data received at the MIDI IN port. Each MIDI OUT port can supply one and only one MIDHN port. For this reason some MIDI devices have several MIDI OUT ports to transmit signals to multiple MIDI instruments. A MIDI cable consists of a shielded single twisted pair of wires with male DIN plugs on each end. The shield of the cable is connected to pin 2 and the twisted pair is connected to pins 4 and 5. Pins 1 and 3 are not defined and the specification recommends they not be used. The cable may not be longer than 50 feel. Note that the 5-pin DIN cables sold to interconnect some types of hi-fi equipment are not MIDI cables. Hi-fi DIN cables do not have the shield connected to pin 2 and therefore these cables are more susceptible to induced electrical noise interfering with the MIDI signal

The Software Specification

While this article is primarily a discussion of the MIDI hardware standard, some mention of the software specification is needed. A complete treatment of MIDI software programming, however, would require several articles. Briefly, most MIDI communications consist of multi-byte messages which are constructed of one Status byte followed by one or two Data bytes. Messages are divided into two types, Channel and System Channel messages include a four-bit number in the least significant nibble of the Status byte to indicate which one of 16 MIDI devices is to respond to the message. The most significant nibble signals the receiver as to the function the transmitter expects it to perform. The most significant bit in the Status byte is always set to differentiate Status bytes from Data bytes. Two exceptions to this message format are System Real-Time and System Exclusive messages. Real-Time messages are used for synchronizing all MIDI devices in the system including sequencers and rhythm units. Exclusive messages are special communications which any manufacturer may define for use between its own MIDI devices.

For example, to send a message to MIDI device 7 to play middle C mezzo-piano, the transmitter would send 10010100 00111100 01000000, 1001 = Note On, 0100 = channel 7, 00111100 = 60 (middle C is note number 60), 01000000 = 64 (a note velocity roughly equal to striking a piano key mezzo-piano). Note that this message simply commands device seven to begin playing middle C. Middle C will continue playing until it is commanded to stop with a Note Off message or a Note On message with zero velocity. Another important message is the Program Change message which commands a receiving device to select a new voice

or patch setting. There are several other messages as well including control signals from pitch wheels, breath controllers, etc. MIDI software has greatly expanded from that defined in the original specification. The members of the International MIDI Association recognized that this was inevitable and desirable and actively encourages member manufacturers to make readily available information on new commands or message formats that a firm may introduce on new equipment.

The Hardware Specification

The MIDI signal itself is a 5 mA current loop operating at a speed of 11.25 Kbaud (+/- 1%), asynchronous. Each byte is transmitted by a Universal Asynchronous Receiver/Transmitter or UART integrated circuit and is preceded by a start bit and followed by a stop bit. While the transmitter design is relatively noncritical as long as the 5 mA current loop specification is adhered to, the receiver circuit must contain an optoisolator which has a rise and fall time less than two microseconds. The main purpose of the optoisolator is to ensure that the transmitting MIDI device is electrically isolated from the MIDI receiver. An optoisolator with as fast a rise and fall time as possible helps reduce the dreaded "MIDI delay" problem which occurs when chaining more than three or four instruments. MIDI delay will cause the farther instruments to play noticeably after a key is pressed on the transmitting instrument.

The MIDL specification identifies two optoisolators, the Sharp PC-900 and the HP 6N138, as acceptable although others may be satisfactory. The hardware specification includes a schematic diagram of the final receiver, transmitter and thru portions of a MIDI interface. See Figure 1

The MIDIOUT port has pin 4 of the female DIN jack connected to +5 volts through a 220 ohm resistor. Pin 5 is the transmitted signal which also passes through a 220 ohm resistor. One or more invertors, as shown in Figure 2, are used to buffer the output of the UART and to ensure that current is ON for a logical 0. The MIDI IN port receives the signal at pin 4 which is passed to the input of an optoisolator through yet another 220 ohm resistor. Inside the optoisolator is an LED which turns on and off with the received signal. The 0 to 5 volt signal transmitted from the UART divided by the total resistance of the three 220 ohm resistors and the LED makes up the 5 mA signal. The light emitted by the LED inside the optoisolator falls upon a photoreceiver which switches a +5 volt signal on and off. This signal is passed on to the receive section of a serial UART and is also buffered and connected to the MIDI THRU port, if present, in the same way as a MIDI OUT port. Pin 2 is left unconnected at the MIDI IN port to prevent shield ground loops which could induce electrical interference into the MIDI signal.

The Amiga Interface

Unlike Apple and Atari, Commodore did not design a MIDI port into the Amiga, choosing to rely on third party developers to provide a suitable interface. Fortunately, the Amiga engineers did provide a programmable UART integrated circuit for serial communications capable of being set to communicate at the 31.25 Kbaud speed required by MIDI. Unlike most of the serial ports available for PC clones, this allows the Amiga to send and receive serial communications at the rather speedy rate demanded by MIDI standards without the addition of a suitable UART in the MIDI interface.

The only thing an Amiga MIDI interface must provide in addition to the standard MIDI circuit is the hardware to properly implement the 5 mA current loop output and the 0 to 5 volt input from the optoisolator. Since the Amiga's serial port is a standard RS-232 port normally. used to communicate with modems and serial printers, it is designed to send and receive signals which switch between -12 and +12 volts. Some form of signal level conversion is necessary to convert the +/- 12 volt signal to 0 to +5 volts. The two most common level conversion chips are the 1488 and 1489. The 1489 accepts almost any voltage level input and converts it to 0 to +5 volts. The 1488 performs the opposite function, converting a 0 to +5 volt signal to a signal which switches between voltage levels

Figure One MIDI Standard Hardware Based on MIDI 1.0 Specifications





applied at pins 1 and 14. These two chips are also used inside the Amiga itself to convert the 0 to +5 volt signals generated by the internal logic to drive the RS-232 port. See Figure 2.

To convert a received MIDI signal, one must feed the output of the optoisolator directly to pin 2 of a 1488. With the exception of the Antiga 1000, all Amiga serial ports have +12 volts connected to pin 9 and -12 volts connected to pin 10 of the DB-25

connector. The 1488 can be powered by connecting pin 9 of the DB-25 connector to pin 14 of the IC and connecting pin 10 of the serial connector to pin 1 of the chip. Pin 7 (Ground) should be connected to pin 7 of the DB-25 connector. Fin 3 of the 1488 will provide a + /- 12 volt signal to the receive input, pin 3, of the serial port. While the 1488 contains four converting gates, only one is needed. Amiga 1000 owners will find this method of signal conversion difficult to implement since the 1000 does not supply -12 volts through the serial connector (+12 volts is available from pin 23). Amiga 1000 users will either have to supply -12 volts externally or use an integrated circuit like the Sipex SP232 which contains a voltage doubler and invertor circuit to convert +5 volts to a +/+ 10 volt signal level, which will be adequate to drive the RS-232 port.

The transmitted signal from pin 2 of the Amiga's serial port must be converted from + / -12 volts to a 0 to +5 volt signal. Since only the Amiga 1000 provides a +5 volt power output from its DB-25 connector (pin 21), a 7805 +5 volt regulator should be used. Power from pin 9 of the DB-25 connector is applied to pin 1 of the 7805 and ground from pin 7 of the connector is wired to pin 3. The +5 volt output from pin 2 of the regulator is connected to pin 14 of the 1489 IC. The 1489, like the 1488, also provides four gates. Thus allows the use of one 1489 to supply three MIDI OUT ports and one MIDI THRU port. Connect pin 2 of the Amiga to pins 1. 4, and 10 of the 1489 and you'll have MIDI OUT's on pins 3, 6 and 8. Simply connect pin 3 of the 1488 to pin 13 of the 1489 and pin 11 will provide a MIDI THRU output. Since the Sipex SP232 chip contains two RS-232 to digital receivers and two digital to RS-232 transmitters, you may want to consider using it if you need a only single MIDI OUT, a MIDI THRU and a MIDI IN port. The advantage to using this chip is that you could provide an external source of +5 volts to power the circuit, and the interface could be connected to any Amiga computer (with a gender changer for the 1000, of course). Small wall socket power supplies of -5 volts are readily available and relatively inexpensive.

Construction Hints

Construction of an Amiga MIDI interface can be quite simple. Assembly techniques are non-critical and most of the electronic components required are available at your local Radio Shack or other electronic parts outlet. Only the optoisolator or the Sipex chip will have to be special ordered. Total cost will be around \$30.

Here are a few tips which can be applied to any hardware you intend to connect to your computer to reduce the chance of accidentally damaging your machine. All designs should be sketched and thoroughly researched before anything is assembled. Your initial circuit should be built on a solderless breadboard which allows quick and easy changes. After double checking your breadboarded circuit for accuracy, connect your circuit to the Amiga in the safest way possible. Since the Amiga's power supplies are reasonably well protected against shorts or overloads, simply powering up the circuit should be your first step. For the MIDI interface, for example, connect only the +/-12 volt pins and ground to your prototype circuit from the computer with the power off. With a voltmeter connected to ground and +12 volts, switch on the computer. If the voltage does not immediately rise to around +12 volts, switch off the computer. Disconnect the interface and switch the computer on again. Check between pin 7 (ground) and pin 9 (+12 volts) on the RS-232 connector to make sure you haven't damaged the +12 volt supply. If you are powering your interface through the serial port of your computer, make sure you have a serial cable with all 25 pins connected. Most serial cables have only the most commonly used pins connected. If you are trying to use one of these cables, the +/-12 volt lines will not be connected to your interface and the circuit will not work. Be careful using a serial cable with all 25 pins connected with any other serial device. Some moderns, serial printers, etc., may be damaged by the presence of these 12 volt signals.

Once you've established that the circuit is not shorting or overloading the +/-12 volt supplies, connect the transmit and receive pins to the interface and again measure the voltage after switching on the computer. If everything seems to be working properly, switch off the computer and plug in a MIDI cable between the MIDI OUT port and MIDI IN port of your interface. Check your voltage levels once again. Now boot up your machine and run your favorite telecommunications or terminal program. It doesn't really matter what baud rate or bit settings are used, but make sure your local echo is turned off. Now, type on the computer keyboard. If everything is working properly the telecommunication or terminal program will be sending the characters you type out the senial port and into your interface. The interface will transmit the characters using the MIDI signal standard from the MIDI OUT port and

receive the same characters back on the MIDI IN port. The interface will convert the received signals back to the R5-232 standard and the typed characters will be echoed on the screen lust to make sure you've set your communications program up right, disconnect the MIDI cable and the characters should no longer be echoed to the screen.

Using the Interface

You're now ready to give the interface a try! This interface will work with almost all MIDI software available for the Amiga. It has been tested with *Deluxe Music Construction Sel*, *Bars & Pipes*, *Tiger Cub* and several public domain programs. Plug a MIDI cable from the MIDI OUT port of your interface to the MIDI IN port of any MIDI compatible keyboard. Use another MIDI cable to connect between the MIDI OUT port of the keyboard to the MIDI IN of your computer. The only time you'll need the MIDI THRU port is when you want another MIDI device to receive the same signals received by the computer.

Follow the instructions on accessing a MIDI device carefully when running a MIDI program. Deluxe Music Construction Set, for example, requires you to explicitly enable the MIDI input and output features from the menu. You also have to declare a MIDI channel and 'program change' or voice setting in your score. While DMCS is capable of providing an excellent means of directly editing a score into a format to drive MIDI devices, it does not have the performance input features of a sequencer program like Bars & Pipes, Music-X or Tiger Cub. If your MIDI keyboard is a synthesizer, you may wish to look into the many patch librarians available to help organize and store your settings

Programming the Amiga in Assembly Language Part I—Getting Started

by William P. Nee

INTRODUCTION

Writing assembly language programs for the Amiga is not that complicated. The commands are short, simple, and varied enough to let you do two or three routines with just one phrase. I have placed a glossary of commands at the end of this article, and also I will discuss each one when it's used. In this series I'll cover several types of programming techniques and demonstrate a new procedure in each article. All of the machine language programs may be assembled using the A68K Assembler and Blink, both excellent public domain programs, included on this disk; no other files or "includes" are necessary. You will need to refer to previous articles as we go along since not much old information will be repeated. All of the programs will run on an Amiga 500 using WorkBench v1.2 or higher. Thanks to Adrian Kotik for debugging, proof-reading, and putting these articles together.

First, let's get some terminology out of the way. Your computer is filled with memory locations called bytes. Each byte holds eight bits (called, from leftto right, bit7 to bit0) of information either a "0" or a "1." Using just these two numbers (called binary or Base 2 system) all values, commands, and instructions can be represented. In one byte alone, there are 256 (2") possible combinations of "0" and "1." If you combine two bytes you get one "word," and two words make up one "long word" that holds 32 bits of information. With only 512,000 bytes available in a standard Amiga 500 with no additional memory, you can begin to get some idea of how much storage room is available.

Even though the computer uses the Base 2 for its numbers, programmers find it easier to use the decimal Base 10 or the hexadecimal Base 16. With the latter, you have to add six additional numbers (called "A" through "F") to the usual 1 through 9. So 10 in the Base 16 is 9+1 or A, 11 is B, and so forth: 16_{10} is 10_{10} . Since the largest number a byte can hold is 255_{10} , it is often convenient to think of that as FF₁₀. To distinguish numbers in the Base 16—usually called HEX—from numbers in the Base 10, the HEX numbers are prefixed with #S and HEX locations in the computer's memory are prefixed with \$.

REVIEWING THE BASES

If you're familiar with Base 2 math, you might want to skip this section. With just two numbers to use, the binary system isn't that complicated but this is a good time to review it. Addition is simple; 0+1=1 and 1+1=10. Since each digit represents a power of two, the number 111, would represent (1*22)+(1*21)+(1*20) or 7 or As numbers get higher, they also get longer to write so you can see why the Base 16 or HEX became popular. Now with each number representing a power of 16, the number #\$FF would mean (F*161)+(F*160) or 255 - remember that A through F in HEX actually represent 10 through 15 in Base 10.

The most confusing part of computer math is probably negative numbers. Since there is room for only those 0's and 1's, how do we get a minus sign in there? You have to think of the numbers you're using as being on a giant wheel going from 0 to, let's say, #SFFFF. This number fills all the bits of one word so it makes a convenient example. Turning our imaginary wheel to the left will show all the positive numbers: 0.1,2, etc. Rotating in the opposite direction must then indicate the negative numbers. Since the first negative number is #SFFFF, it must be the same as ~1; next would be #SFFFE and it must be -2 and so forth. Half way through the wheel in either direction is the boundary between positive and negative numbers.

The only difference between our positive and negative numbers is that the left-most bit (or Most Significant Bit) of any negative number must always be set, that is, be a "1"; the MSB of any positive number must always be a "0." This will be true for whatever size number you use—byte, word, or long word. Since we said that half-way through the wheel was the change-over between plus and minus, we can effectively use only half of our number range if we are going to need negative values. That is, if your numbers range from 0 to #SFF, the portion from 0 to #S7F is positive and from #SFF to #S80 is negative. So the smallest number is -128 and the largest is +127. If you need numbers outside these values you'll have to increase the size of the range, probably from one byte to one word or #SFFFF. Now the numbers from 0 to #S7FFFF are positive and from #SFFFFF to #S8000 are negative.

I said that this was necessary if you wanted to use negative numbers. But what if all your values will be positive ("0" is always considered positive)? No problem; use the full range of all your numbers, that is, from 0 to #SFF (0 to 255) or from 0 to #SFFFF. The computer will work the same, but is it up to you to interpret the results.

When we get to BRANCH commands later on, you'll see that some of the branches will depend on whether you could have a negative or positive result. More mistakes are probably made in this area than anywhere else. Your program can go along perfectly and then suddenly display the "Big Bang" theory simply because you forgot that there could be negative values and didn't branch accordingly. My early examples will all use positive values so we won't have to worry about negative branching yet. And what about fractional numbers? That's even more fun!

SETTING UP YOUR ASSEMBLER DISK

Enough theory. Let's actually get set up and try a simple program. I suggest you use a stripped down version of WorkBench adding A68K and Blink which are both included on this disk. There may be later versions of those two PD programs, but I've had no problems using these. You can create your own disk by copying a WorkBench disk and removing the unnecessary files or start with a blank disk, format it, use INSTALL to make it selfbooting and then add these files. Name this disk ASSEMBLER: I find it easier to put the programs and commands I'll be using in RAM: and RAM:C so my disk and start-up sequence look like:

DIRECTORY OF ASSEMBLER

C DIRECTORY a68k blick rd	L DIRECTORY Port-Handler Ram-Handler	DEVS DIRECTORY nerrator.device paralet.device	
copy deleta der	S DIRECTORY startup-sequence	System-configuration PRINTERS DIRECTORY (vour ponter)	
9d	LIBS DIRECTORY	(the process)	
makedu path more	maineecouppas library maintrans library translator library	topaz.lont TOPAZ.DIRECTORY	

There may be other C commands you want to add such as "type" or "info" but they probably won't be needed in RAM:C. Now that you have the necessary files on your ASSEMBLER disk, I suggest that you use the following startup-sequence.

ASSEMBLER:S/STARTUP-SEQUENCE

dir ram: makedir ram:c copy c/a68klblinklcdlcopy ram:c copy c/deleteldir/edimakedir ram:c copy c/more ram:c path ram:c cd ram:

This startup-sequence will copy all of the files you will be using into RAM: C and will put you in the root directory of RAM: where you'll be saving and assembling your programs. At this point I suggest formatting a fresh disk and calling it PROGRAMS. Once the programs have been debugged and assembled in RAM:, the executable programs and source codes will be copied onto this disk. While all of the libraries on your ASSEMBLER disk won't be used immediately, you might as well start tracking them down now. They'll all be needed eventually. I use ED to type the programs, but you may use any word processor that saves files in the ASCII mode. When writing a machine language program the routine heading goes immediately to the left; commands must be at least one space over but I use one tab over; the rest of the line, if any, must be at least one space or tab over from the command. Comments may be added but must be preceded by a semi-colon. It is always a good idea to add as may comments as possible; two months after you write a program it will be hard to remember what all those lines were supposed to do. And try to make routine headings a good understandable name. It's easier to figure out what "SendToPrinter" will do rather than "L10".

YOUR FIRST ASSEMBLY LANGUAGE PROGRAM

This is a short, simple program that will get you started and let you check out your new disk. It causes the red power light on your Amiga to blink off and on six times. Right now don't worry about the commands and all those other cryptic symbols (we'll get to them later); just type it in as written. Boot up your Amiga with the ASSEMBLER disk and type in the following program using ED or your favorite word processing program. Since machine language programs use simple words and phrases I prefer using ED. It's also a fairly short program itself and takes up very little room in RAM:C.

SCAFC:		
mawe-1	sp, stack	isave the Stack Pointer
number_df_t	1.000 9.1	
payer	46,dI	mumber of times to blink
power_off:		
0100	12,5bfe001	iset bit one to 1
maveq	\$5,30	triear d0
delayl;		
Subg.w	#1/d0	raubtract from d0
One.3	ielay1	(Branch if not back to 0
deiny7:		
W. pdates	#1,d0	
inv.e	341422	
power_on:		
dr. ch.na	4053_SbFe001	clear bit one to 0
maxima	#3,:10	
delay3;		
sould a w	#1,60	
Little .S	delay)	
delay4:		
w.pdus.	#I,d0	
2000.0	delay4	
pdula	#1,01	:decrease number of blinks
bne / s	power_off	rhianch if not finished
rodye.2	scack sp	stastore the Stack Pointer
2,2,12		freturn 10 CLT
121/1-71		/force an even address
stack de,1	0	stack storage
end		; end of listing

After typing this program, save the source code in RAM: as POWER.ASM; all A68K programs must end with .ASM To assemble it, type A68K POWER.ASM. Since you're in RAM:, the disk won't have to come on and the assembly is extremely fast. If there are any mistakes, the assembly listing will stop and tell you what line has an error. If you were lucky enough not have to have any errors the first fime, try changing the first "move.1" to read "mave.1". Now when you assemble, you'll get an error in line #2 and the phrase "No Such Op-Code " Generally the A68K assembler will only catch syntax errors and some type mismatches (bytes, words, etc.). The assembler can't tell you it your program won't work properly or may crash.

After assembling a program, A68K creates a new file—in this case called POWER.O. This Object file must be linked to make it an executable program, so type BLINK POWER.O. Now you have another listing called POWER: this is the assembled program. At some later time you may want to delete the accumulated O files. Before trying the assembled program, I would save it along with the source code to disk; if your program does crash, you'll loose everything in RAM:. You can either save your programs to the assembly disk or, as I usually do, to a second program-only disk called PROGRAMS. From RAM: type COPY POWER:ASM PROGRAMS: and COPY POWER PROGRAMS. As you get more programs, you may want to create directories on your program disk and save programs in them, but for the time being you can save this short program directly to disk.

Now you're ready to try your program. Type POWER and the Amiga red light should blink six times and then stay on Congratulations! For many of you that was probably your first assembly language program. By the way, throughout this series I use "assembly language" and "machine language" interchangeably. With your first program out of the way, it's time to get down to basics and discuss how the Amiga processes the machine language programs.

GETTING TECHNICAL

The Amiga stores information in registers. There are eight 32-bit registers used for data (d0 to d7) and seven used for addresses (a0 to a6); an eighth register (a7) is available but it is generally used as a Stack Pointer (SP) for saving information locations. Part of yet another register (CC) tells you the "Condition Code" for any operation—mainly if an operation produced a value of 0 or not, and if the result was a plus or minus number. There are four main points to remember when writing Amiga machine language programs:

- All main headings (library, array locations, etc.) will be at different locations when you first power-up; well, all but onc. This forces you to write "locatable" programs but more about that in a later article.
- Most subroutines are located in various libraries and are accessed by going to an "ottset" location from the library.
- Important items are structured; when setting up a screen, for example, there are various elements that must be defined in a specific order. This allows you to change parameters since they are at a fixed distance from the main item.
- All address locations must be even addresses—this is usually handled by the assembler.

Finally, a brief discussion of the two major commands used in assembly language. MOVE is used to put a value or the contents of one register into another register. Some of the possible variations on MOVE are:

MOVE B	moves the right-most byte
MOVE.W	moves the right-most word
MOVE.L	moves the entire long word
MOVEA	moves only to an address register
MOVEQ	moves a signed byte value (a number from
	-128 to +127) to a data register
MOVEM	moves several registers at once

The other command is LEA—Load Effective Address. It's used to move labeled locations to an address register or to increase the contents of an address register. Some examples are:

LEA	name,a1	moves the location or address of "name" into a1
LEA	100(a1)	increases the address in a1 by 100

Any command with a parenthesis around a register means "the contents of."

HOW WE DID THAT?

With that general information, let's review how you caused the power light to blink several times. The MOVEL command saves the contents of the Stack Pointer in a location called "stack." Next, a MOVEQ was used to store #6 in register d1. In the Amiga 500, location \$BFE001 controls, among other things, the power light. If bit 1, the second bit from the right is "0" so the light stays on, but if that bit is set to 1, the light will go out. The Basic AND and QR commands have the same meaning in assembly language and are often used to force a bit location to 0 or 1. Any binary number OR 1 will always be 1 while any number OR0 remains the same: any binary number AND 0 will always be 0 and any number AND 1 remains the same. So when you OR a byte with #2 (10,) bit 1 is set to 1.

Next, register d() is cleared with a MOVEQ #() command -by the way, this is the quickest way to clear any data register. Then #1 is SUBtracted from d0 (resulting in #5FFFF); SUBQ and ADDQ may only be used with values between #1 and #8. The BNE (Branch if Not Equal to 0) will go back to "delay1:" until d0 finally reaches 0; the Sindicates a Short branch (-128 to +127 bytes away). Then the entire delay is repeated so you can notice it. The light is turned back on by clearing bit 1 with ANDI.B #253 (11111101.); the "I" means that an Immediate number will be used with the AND command. After two more delays register d1 is decreased by 1 and the entire sequence repeated. When d1 finally reaches 0, the original contents of the Stack Pointer are restored. The RTS (ReTurn from Subroutine) takes us back to CLI. EVEN is a code to align the assembler to an even address; as I mentioned earlier all addresses must begin at an even numbered location. After the actual program a space is reserved as "stack" using the storage command DCL 0 (Define Constant as a Long word value of 0). Finally, END signifies the end of the listing.

Let's talk about those libraries in more detail. The major ones we'll use in this series are EXEC (tasks, memory, and ports), DOS (disk functions, read, write), GFX (graphics), MATH, MATHTRANS (sign, cosine, etc.), INT (windows and screens), and TRANSLATE (speech). While there are several more libraries, we'll work mainly with these. All the subroutines we use are

AC's TECH Back Issues

AC's TECH Premiere Issue Volume 1, Number 1

Magie Macros with Reference to Jeff Lawin Recommission MI M data trion a hard click, coping with library orders, conting torage data, and a less transformerssion and orderal trickle that can be three with the Reference data another and of the magic macro.

AmigalHOS; EDIT and Recursive Programming Techniques in Mark Paralas

Creming a hard disk attait using only AmigaDOS a normalis and the LDAT fine estate using measure programming seclarityzes and fates as templates for EDIT commands, row data r

Building the ValColl 256 Gravitate Digitation by Todd Ellion Build on R-Int (256 gravitatio) digitates for Jave

Han \$80 Includes milliocition, schematics, and all necessary unlivered (on glid) (

An Introduction to InterProcess Communication with ARASS to Poin Sugaritie An immite communicative picel, at what (Etales hoainst working with IPC and ARESS, your disk)

An Introduction in the allow laboury by the Parce Spend development with the dissidence ILHM FORM specific fiberry. Item laboury offices programmers have been introduced anneral UFF calls, using web sectors to be several topoles of ILBM specific calls. (include)

Developing a Relational Database in C., Using dBC III to Writern Investition Developing a database application using die Lattice dBC III (Invest)

Using Januation's Proportional Godgets from FORTRAN 77 by Joseph R: Pairs's Using About's FORTHAN 77 historic advantage of monitof the Antiqu's KOM Keniel surface writing extra C or assessibly language code. (an disk)

FastBoat: A Super Bandblack to Han Interved Fundlant to 5 browblack this quickly leads on paire data non-memory, creates a RAM, data, and boots from that RAM, data, tur data)

AnageDD5 for Programment to Draws Cases If you want to delete bless had out ble suppl attributes or the answers of disk space, preside or mult discounce, and even no processes form under your program. then read only on disks

Adapting Mattel's Proceediance in the Amiga to Plant King and Multi Carput Contrast is special cable and write the suscessary achiever to Modula 2.2 that not inprese the Procediance to the Amiga (on disk)

Silent Rinary Rhappondies by Rinnet Tors A pinen Da programmigna

AC's TECH Volume 1, Number 2

CAD Application Design: Part I--- World and Vire- Transforms by Fires) W. Anneld deviced brock at the realismants, and programming technologies used in CAD system design Use these basiss to concease the building blocks of 4 run-dimensional CAO programs you dide.

Interfacing Assembly Language Applications so AReas to Self Olusi

How to add an ARC is a orghomorphone to a program demonstrated by adding a complete ARCAL implementation to a 66000 assembly longuage point program. (or dails)

Adding Help to Applications Entity by Philip 5 Fasters

Implement a context semialize for one help facility in rotir applications using this powerful, yet carg-mome tanenal of functions ... part call help(1) on sloke

Programming the Amoun's GUI in C-Pari I by Paul Contempory

Getting statted in C programming on the Asinga lincludes a presistation of the first concept in the Amiga linustion environment. the opening of (denoves, (a), disk.)

Induktion and Graphics in ARexs Scrips: in Inff Glass

Eulog the AReas Innelion library, en turni litrary, unich adda a few deuen AReas commands that attow in AReas weaps to siliar broasien and Graphics library matters (on dox).

UNIX and the Amiga by Mile Hubbarr A different substances to UNIX for the Attonic or generation?

A Weg and a Half (or a Budget (or 90)-2001 Add 5(2K-0) EAM to smar (MB Amiga 50) ((tiggy5ack-wyle) for alread 500)

Accessing Amiga Initiation Gudgets from a EORTRAN Program: Part II—Using Ibusilian-Gadgets in fourth R. Pouet Comp & direct interface to the Amiga's ROM Kornel in access Immisco beolean gadgets. Use these secondary is create (Lapiter's Meson Semilitane (new dok).

Towfflow Part 1: An Introduction to 3-D Programming to Provide Quart The first in a series of artis to presenting the solutions on constraint Amiga programming problems. This time we look at 3-D programming concepts. (or dock) AC's TECH Volume 1, Number 3

CAD Application Design-Part II by Forest W. Arnold

Describing an event-driven program which wait to: or prove resize, and renate objects or pan and zoner our model within using pust the human true dock.)

C Materia for Allexa? by Goosd Blackwell Accessing the fall power of Allexa from C, using give remines and program.

VBRMON: Accombly Language Monutor by Data Balavierk. Explore your Amuga with this imagar and interesting successfy language monutor (ion data).

The Divelopment Of An AnogaDOS 2.0 Command Line Unitin by Brown Coun-Using the new features and structures of Amig4005 2.0. develop the TO' command-line writtyn-a way to anounate any Change the current directory, based on-a wildcard since (on link).

Programming the Amiga's GUI in C-Part II by Paul Castonyners Sout multy programming the Amiga in City coasting your test workes (on duit).

Programming For IEAM-6 to then working An immediation of threaties and ractiniques imported to program for the IEAM-E display

Using KuwDoPmi in Assembly by Jeff Local H you have a result to provide measured arrings in interediler, may waiting targe and code toilling your principlemen and read on? (on dok)

WildStar: Discovering An AntigaDOS 2.0 Hilden Feature for Brann Council Put the antirock back tests the AntigaDOS wildliced—two entry under AntigaDOS 2.0 (on dois)

Configuration Tips for SAS-C by Pool Converging Configure your system for maximum performance with SAS-C – even on anamal systems (no. dok).

Hash For The Masses: An Introduction To Hash Tables, by Power (Ad) An introduction is a summer scheme which excess in quick debriving, interviews, and queries: (see data).

Accessing the Math Co-Processor from RASIC In R.P. Horitand Using Ibratics, access the Amiga's multi-usprocessor from AmigaBASIC (on dok)

AC's TECH Volume 1, Number 4

State of Amiga Development-Denver DesCon Address

EATS Vice Provident Jet) Scherb, shares has Reynold address with AC's TECH readers

GPIO-Law-Cost Sequence Control 1- Ken Hall

Take control of your Anorga with any Yaden Toxotex implied General Purpose Interface Ken scontourition of a source controller certain — which you can book?—and a inteortware traggic provides for precise automatic or manual young? (on dok).

Programming with the ARecaDB Records, Manager in Bernin Jackims Laam to one this powerful new ARecs chased desideat anythe in creating a phonohook anticidater of use with the popular share ware effectivenessing regions. VLT (on data)

The Development of a Ray Tracer—Part I In Brann Conto The First Of a two part series featuring the Heory and oppleation descent of a Full Jeanord

and application design of a forf featured unplementation of an open-ended say-tracing package, (on disk)

The Varafire Solution—Haild Your Own Variable Rapid Fire Jepstick by Lee Brewer Give your layonic loyonek new power with this moste, yet detailed step by dep tational

Programming the Amiga's GUI in C-Part III

Paul continues his popular samial series with handles, structuring slipplay reachines are introduction to programming graphic images and much nonet top disk).

Using Interrupts for Animuting Pointers by Juff Laure

In If demonstration a bottom way to ensurate promotion as well as the proper last of two types of unempiper (on dok).

STON—An ARexx-based System for Maintaining Stock Prices by Jack Fox Stay on top of the toucher with The Advantage spreadulent. the Bandhardti using emmanications program, the DEnic fullymearum Service, and Arenx to ine it all inogeneo. (no disk)

Language Extensions—Strings of Type SringS In Junuar Hammonds

An instruduction to the implementation of strates of type Sarina's using C constructs. (on dok)

AC's TECH Back Issues are available for ONLY \$14.95 each. For a limited time, The AC's TECH Volume 1 (Complete Set) is available for JUST \$45.00

Call Now! 1-800-345-3360

(credit card orders only, please)

AC's TECH Disk Volume 2, Number 1

A few notes before you dive into the disk!

- You need a working knowledge of the AmgaDOS CLI as most of the files on the AC's TECH disk are only accessible from the CLI.
- In order to fit as much information as possible on the AC's TECH Disk, we archived many of the files, using the freely redistributable archive utility 'lhare' (which is provided in the C: directory). Ihare archive files have the filename extension .izh.

To unarchive a file foo lph, type lhave a foo For help with thare, type lhave " Also, files with 'lock' icons can be unarchived from the WarkBench by double-clicking the icon, and supplying a path.



Be Sure to Make a Backup!

CAUTION!

Due to the technical and experimental potate of some of the program on the AC's TECH Dark, we advice the reader may solution spectrally because appropriate tradition of the quality and performance of the vehicle of the AC's TECH Dark is assumed by the parchaser. PM Publications fract their distribution or their retailers, will not be likelife for any attest, indirect, or consequencies distributes the table for any attest, indirect, or consequencies distributes the AC's TECH Dark is assumed by their retailers, will not be likelife for any attest, indirect, or consequencies distributes the AC's TECH Dark. This appreement may not apply in all geographical areas: 1

Although pany of the individual files and therefores of the AC's TECH Data are freely evaluationable, the AC's TECH Data are freely evaluationable, the AC's TECH Data interface of the state of the evaluation of the AC's TECH Data are copyingly (7190) 1001 for PM Publications (the and may link be duplicated to my 4 at the PM Publications (the and may find be duplicated are and may for the duplication are are breaked as the evaluation of the AC's TECH Data are copyingly (TEM) and a setting the the evaluation of the AC's TECH TECH Tech.

Also, he extremely careful when working with familiary projects. Check your work, respective record new damage that can happen. Also, he aware that oning linear process may noted the automation of your computer representable families about or any of its signation or no propriority for any characteristic or not respective between the process. located at a specific offset away from its library location. The PSET routine is, for example, 324 bytes away from the GFX library location; or, more correctly, 324 bytes away will tell you to jump to some location that actually contains the PSET routine. In addition to calling the routines, certain registers must contain specific information for the routine to work. As we use each library and routine, I'll include the offsets and required information.

As I had mentioned earlier, you won't know library addresses at power-up except for the EXEC library. It's address is always stored in location 54 and it's always available. The routine to open another library is called "OpenLibrary" and is located 552 bytes away from the EXEC library. For this routine to work. register all must contain the location of the library name you want to open, and d0 must contain the latest acceptable version number of that library, usually 0.

OPENING A LIBRARY

Let's try opening the DOS library. This routine will work for all libraries by just changing the library name. The three main portions of this program are the offsets we'll use, the program itself, and a data/storage location. After the library is opened, we'll use two DOS routines to print a message and print the actual library location as a HEX number. The "Output" routine gets the CLI screen-handler and returns its location in d0. The "Write" routine will print a message or any characters in a string buffer;

A68K ASSEMBLER COMMANDS

OPCODES	SOURCE, DESTINATION	OPCODES	SOURCE, DESTINATION
1.00		BRANCHES	And and the second s
ADD,B/W/L	add a number or register to a register	Contraction of the second	GENERAL
ADDA	destination is address register	BCC	Branch If Carry Clear
ADDI	immediate number	BCS	Branch if Carry Set
ADDO	#1 through #8	BRA	BRanch Always
BCC	same as Branch If Higher or Same		accession and a
BCS	same as Branch If LOwer		UNSIGNED
BCHG	lest a bit and change it.	BEO	Branch II EQual
BOLR	clear a bit	BHI	Branch if Higher
BSET	set a bit	BHS	Branch if Higher or the Same
BTST	fest a bit	BLO	Branch / Dwor
CLR	clear a register	RIS	Branch II Lower or the Same
CMP B/W/L	compare value and remister	010	orange in cower or the same
CMPA.W/L	compare to address register		SIGNED
CMPI	compare immediate value	REO	Broods II Efficial
CMPM	(address register)+ (address register)+	BME	Princh / Lot Found
DIVS	signed 16 bit division	BRE	Branch // Crontes then as Edual
DIVU	unsighed 16 hit division	POL	Branch II Greater than or equal
EXG	swap any musicing	BIE	Branch II Greater Than
EXT	extend the sign	DIT	Breach if Less than or Equal
FXTW	avtend to hite 8 through 16	DAAL	Branch II Less Than
EXTL	extend to bits 16 through 31	DIVI	Branch II Minus
IMP	iump to couting	DPL	Branch If PLUs
ISB	jump to routine when completed	BOOLIAN ODER	ATIONS
IEA	Load Ellacture Address	BUULIAN OPEN	ATIONS
MOVE BANA	romo unico os posistos	AND BAWL	can't use address registers
MOVEO	hidve value of register	11101	must be al least 1 data register
MOVEL	Value is +120 to +127	ANDI	Immediate value number
MOVEN	minediate value	DH.B/W/L	can't use address register
MULE	move to address register		must be at least 1 data register
NOD	signed 16 on multiplication	ORI	immediate value number
EWAR W	No OPeration	EOR B/W/L	source must be a data register
SWAP W	exchange top and bottom 16 bits in data register	EORI	Immediate value number
ISI B/W/L	compare location or register to 0	NEG/B/W/L	reverse the sign
CHIETE ONLY	ATA DECISTERS	NOT.B/W/L	reverse 0's and 1's
SHIFTS - ONLY L	JATA HEGISTEHS		
Shift.B/W/L	#1 through #7,data register	STORAGE	Commence of the second s
SHIT B/W/L	data register(#1 through #63),data register	DS.B/W/L	deline storage (amount)
ASL	CC < 0	DC B/W/L	define constant
ASH	same -> CC	Pointer dc.) 0	
LSL	CC < 0	Title dc.b 'my tit	tle',0
LSA	0> CC	Array dc.1 0,0,0	.0,0
ROL	CC <===> high bit	DCB.B/W/L	define buffer (length, value)
HOH	bit 0 <===> CC		the second s

this command requires the handler location from "Output" to be in register d1, the message or buffer location in d2 and the length of the text to be printed in d3. Any text must be stored in a byte storage area (DC.B) and surrounded by single quotes; text is usually followed by a comma and 0 to indicate the end of text. While "Write" does not check for a 0, the 0 can be used to determine text length. Often a ",10" is included after the text to force a linefeed or jump to the next line, but be sure to count it as a character string and include it in d3.

Let's look at Listing 1 in more detail. As short as it is, this will be the format of most of the programs we'll write—define equates and offsets, set-up, the main program, close-out, and data/ locations. It's really pretty easy to understand the general procedure.

The first two offsets I used "OpenLibrary" and "CloseLibrary" are both in the EXEC library; after their offset values, I have included the information that must go in specific registers for the routine to work. The next two offsets are DOS routines and only "Write" requires information in specific registers. I then MOVEd the current starting location to a temporary storage area called "stack," where it will remain until the end of the program. The address of the library name I want to open is stored in register aI and the latest acceptable version—in this case 0—is stored in d0. Since the routine I want is in the EXEC library and that location is always in address 4, I stored a 4 in register a6. The JSR (Jump to SubRoutine) will transfer the program to a location -552 bytes from the EXEC address and open the DOS library.

The result of the routine is to return the address of the DOS library in register d0. Most routines return the information requested in register d0. We'll store this address in a location called "dosbase." But what if the program couldn't find the library? In that case, register d0 would contain a 0. Check for this with a BEQ (Branch if EQual to 0). The result of the last operation or procedure always gets stored in the CC (Condition Code) register. So if a 0 was returned instead of a library address, the BEQ will branch to "done:".

Put the DOS library address in a6 and then call the "Output" routine saving the CLI console-handler location in "conhandler" and in d1. The location of the message is stored in d2 and its length of 23 characters in d3. Then the DOS "Write" routine is called to print the message; since CHRS(10) is part of the message, there will also be a linefeed and anything else to be printed will go on the next line.

Next, the DOS library location is stored in d0 as a 32 bit binary number. We want to print it, however, as a HEX number with eight characters, each character being 0 through 9 or A through F; this corresponds to CHRS(#\$30 through #\$39 or #\$41 through #\$46). Since each HEX number is four bits long (#\$F16 = 1111 _), we need to convert each four-bit group into one CHRS value and put it in our buffer, and we'll need to do this eight times.

The ROL (ROtate Left) command will help us out here. Whenever a byte, word, or long word is rotated, everything shifts over one space in the given direction, but the bit that gets bumped off goes around to the other end. Eight rotations would return a byte to its original value. First we'll store our buffer address in a0 and clear d2 and d3. Now rotate register d0 #4 times to the left; the four left-most bits (31 - 28) are now the four right-most bits (3 - 0). We want to keep using this value so copy it to register d2. Since all we want are those four bits. AND the register with #\$F and everything else will be zeroes. D2 now contains a value from 0 to 15. Convert this to its CHRS value by adding #\$30; if this value is between #\$30 and #\$39 branch to "ok." If the value is greater though, you'll have to add #7 to get the CHRS value for A through F. Now, store the string value at the location in register a0 and increase a0 by one byte. The "+" after (a0) will increase that register by the size of the MOVE command. Since we've stored a string value in the buffer, increase the length in d3 by 1; keep doing this until d3 reaches 8. Use the CMP (CoMPare) command to see if a value and a register are the same.

When the length reaches 8 we're almost ready to print the string buffer. As before, put the "conhandler" location in d1, the buffer address in d2, and the length plus #1 (we'll also print a linefeed) in d3. Again, call the "Write" routine and whatever is in the buffer gets printed as an eight-digit HEX number.

After the entire routine, you have to close the library opened at the beginning. "CloseLibrary" is an EXEC routine and requires the library address to be in register al. Any library that has been opened must be closed before ending the program. Again the EXEC location is stored in register a6 followed by a JSR to the "CloseLibrary" routine. This is followed by "done:". If the "OpenLibrary" routine hadn't worked, the program would have branched to here since there was no opened library. The contents of "stack" are restored to the SP register and the RTS returns to CLI.

The EVEN command will align us on even addresses so that all of the following addresses will be acceptable. Three long word locations are reserved ("stack," "dosbase," and "conhandler") with DC.L.0 and the eight byte buffer is reserved with DCB.B.8,0 (Define Constant Block), followed by a CHRS(10) for a linefeed. After some more EVENs, space for the library name and message are both reserved with DC.B. The message is followed by a CHRS(10) and both are terminated with a 0.

After typing this program, save it as PRINT_D0. ASM. Next, assemble it with A68K PRINT_D0. ASM and when its error-free, blink it with BLINK PRINT_D0.0. After saving the source code and program to the PROGRAMS: disk, type PRINT_D0 and there's your message followed by the DOS library location. You could use this program to print the contents of any register, not just d0. In a future article we'll use some printer codes to add italics, underline, etc.

A68K is very versatile. All of my programs are written with lower-case printing and that is acceptable. If you forget the S (Short), I (Immediate), or A (Address register), A68K will usually add it to the command for you. But try to get into the habit of writing the best program you can and use A68K only to correct mistakes and assemble.

IN THE FUTURE

In the next article I'll show you how to write some macros that will make assembly even easier. We'll also teach our Amiga how to multiply and divide using fractions and even get it to talk to us! Future articles will discuss graphics as we explore the Mandelbrot/Julia Sets and work our way through arrays. Then it's on to Menus and Gadgets. I would keep re-reading the glossary of commands at the end of this article and add your own notes and comments to it. Finally, there is no easy way to debug your program. If the problem isn't obvious, set it aside for a while then come back and try again. You could use PRINT_D0 to check the contents of various registers at different times in the program. Usually your error will turn out to be some simple, dumb mistake and you won't believe that you didn't think of it earlier. I try to write the entire program first in Basic and then convert portions of it to assembly. Always save your program and changes before trying them. If you have any questions about these articles you may write to me through the magazine.

Listing One

	1.2					
	ŕυ					
(p	12	r,	P	t)	i	

(Print's)		
cro-		
SUPPORT DATE:	-557	initiation memory deversion
lanı i Vəru İdə	ul) seri	mu culto any, Lease
19639	- 6	1
1.0		in minhasters division
		A REAL PROPERTY AND A REAL
111		
1.1-		
BOX 9 1	- (F =) - (TABLE CONSTRAIN SOLUTION
20/00.1	8 (m)	A ROLL A ROLL IN THE REPORT OF
1991	April Accession	addition I chapter
-0.00_	PO 101	tur entroy
182	phone in construction of the	Jupped why Alderian
1 (P) ()	TV, CONCAUX	a server the set of the server
100		TENNIOUT VIOL 11
myond.	Shear	survey addresses for ad-
1avi -	amfrind (ab)	and the second se
TOM: I		LANCE LOCATION
- 19-1	The second se	
Same	Report Land	1004
	and a second second	1 - 7400 - CALLO
acmed	ALC: 10	1 x x 1 x 2 2 2 1
	201011001	CONTRACTOR OF CONT

ALL REPORTS	TRUCKLINA .	
terve 1	305014 ¢. 01	, tibrary address
1.974	buittin .no	view parter
percen-	A) (15	221011-02
195993	42, 17	r and Ar
10.025		
11153	#1	lenne Teff & Alto to ranht
1007013	dV.d.	readin to d2
Aral. b	837,12	TOUT LLEE BILS
widi_p	#8.07,07	ich (acter 5 wenter
2001-2	15 Jac 16	igredier than 95
00010	24	rarant il noc
and par-	11.52	1055 7 PA 385 A-R
36		
COVE D	182, Fa014	SALEM AN DULLAS
		(Micreano Eutror) Dyte-
ADO: N	11, 31	1 COLUMN PRODUCT
STEL 1	18. (5)	VINE OUN B VETT
1706-8	THEFT	Distance if the
#5Y6.1	contraction .dl	support fals locations
72:01	Westfrix, di	stuffer location
addy.w	41	Andsunt for linefend
12	WELEBIAN	scint Suffereigneteed
	aburd	THE ALBERT THE TARM OF
SHOULD T	1.00	rater library location
	a Lanel Vorviev (wh)	TIME BALLEDING
Jone's'	and the second second	the set of a checker.
0.700 LAL	20051.20	reeturn Stack Pointer
SE.		return to Chi
even		and the second second
11.10.0	36.1 8	STATE FIGHTER
1 Shave	16.1	ellingen location
conhand, er	- 31 L L	vestput- rate becation
toffer	8-W. N. N. U.	sheet builton
ac.b 18		1. Institut
8.0500		T E PAGE I GOOD
Sol. di	.b. Manuel Lineare	Library more
e voeta	and the second of the	a manual mine.
Aug) in	b mus is a built	contribution 1 - Ave. 11
VIN		and a second second

What's the best source of freely redistributable assembly langauge source code?

Fred Fish Disks!!!

from Your Number One Freely Redistributable Disk Source... Amazing Computing!

Call 1-800-345-3360

Programming the Amiga's GUI* in C—Part IV

"Graphical User Interface

Intuition's Border Function

Due to popular request, this series, which was originally intended to last only four issues, is being extended. I thank those readers who have mailed in letters of support. I also encourage others who would like to read about certain aspects of the Amiga's high-level operating system to make their requests known.

This issue contains a pleasant new twist. Somewhere in this text you will find a small programming challenge, a puzzle if you will. The first five readers to best solve the puzzle as described will win a one year subscription (or renewal) of AC's TECH Magazine. Mail entries to:

Paul Castonguau P.O. Box 505 Everett, MA 02149

I have added this new feature for the purpose of promoting more "Programming as a Hobby" on the Amiga. That's right, some people bought their Amigas to have fun programming it. Why not? Compared to other platforms, it is a programmet's paradise.

In this issue you will find:

1. A Discussion of Intuition's high-level line drawing function, DrawBorder().

- 2. Two implementations of Rosettes using DrawBorder().
- 3. A discussion of Intuition's low level text rendering function. Text().

4. A discussion of Infution's high level lexi-rendering function, Print(Tex)(-).

The example programs in this issue all use the programming shell that we have developed over the course of the last three articles. For your convenience, a copy of it has been placed in each example directory, along with a make file (Imktile). If you make modifications to the programs you can conveniently re-compile by entering LMK on the AmigaDOS command line, or by double-clicking the "Build" icon on the WorkBench.

In this article, I use the term "line drawing" to mean a graphic image that is constructed of straight lines drawn between any number of defined points. In a future article I will discuss another kind of graphic image, one that is defined directly by bitplane data.

With the last issue you began drawing some simple images using the Amiga's primitive functions. WritePixel(), Move(), and Draw(). These are probably the most often used graphic functions on the Amiga for creating line drawings. WritePixel() illuminates

by Paul Castonguay

individual pixels on the screen, Move() places the graphic cursor (or drawing point) at any desired location, and Draw() connects two points with a straight line. To create complex drawings using these functions, you write a series of instructions that mirrie how you would produce the same thing yourself using pencil and paper.

Speeding Up the Drawing Process

Often the points of a drawing are based on some equation and require floating point arithmetic for their calculation, a task that is more time consuming than integer arithmetic. In some cases we can overcome this slowness by using a programming trick: storing the calculated, pixel coordinate values of all the points in a drawing in an integer array. I like to call this array the points array. Once that is done, the Amiga's graphic functions can render the drawing at any time by using these values directly, without having to perform any further floating point calculations.

A good example where this concept can be used to an advantage is in the drawing of a rosette, which is built up by drawing a large number of straight lines between some smaller number of predefined points, arranged at equal distances around the circumference of a circle. A 23-point rosette consists of some 253 lines. Drawing all those lines using the original equations from which the points were defined, along with some reasonably adequate scaling functions, would require over 2000 floating point calculations. Instead we can calculate the pixel numbers of those 23 points once and store them in an integer array. Then the repetitive invocations of the Draw() function, which produces the actual lines of the rosette, can use those pre-calculated values directly.

A version of the rosette program is reproduced for you this month on the magazine disk, in the directory Rosette I. Observant readers will notice that I have added a macro definition, POINTS, to allow you to conveniently change the number of points in the drawing. I have also increased the size of the point-array (Rosette Points), to allow you to more conveniently draw rosettes having different point sizes. Now, compare the operating speed of that program with the one in the directory called Rosette0. That difference in speed is due to the fact that the one in Rosette0 is performing floating point calculations for every line that it draws, while the other is using the above programming concept.

Intuition's High Level Drawing Function

Intuition's high level, line drawing function, called DrawBorder(), can produce line drawings using this same concept of storing pre-calculated pixels values in an array. It renders by drawing straight lines between points stored in the array sequentially, that is, in tandem.

As with most high-level operations in Intuition, there is a general operational theme to follow when using DrawBorder().

- Declare one or more Border structures to contain the specifications of your drawing, things like its color, how many points it has, ... etc. I like to call this the description structure
- 2. Store the pre-calculated pixel numbers representing all the points in your drawing in an array such that drawing straight lines between them sequentially will reproduce it. This may require that some points be stored a multiple number of times at different positions in the array. I call this array the Border-data-array, to discriminate it from the one we used earlier in our rosette example. The Border-data-array must be located in chip RAM, a special section of memory that is addressable by the Amiga's graphic co-processor chips.
- Link all structures and their respective Border-data- arrays together.
- 4. Invoke the DrawBorder() function.

This general plan is a bit more complicated than using the primitive Move() and Drawt) functions directly. However, it has certain structural advantages, depending on exactly what kind of drawing you want to produce, and it can render complex drawings very fast. I might also add at this point that the above operational theme is similar to that used in another Intuition, high-level function that I will discuss today. Print(Text().

The Border (Description) Structure

The template definition for the Border structure is in the file <intuition /intuition h>. I reproduce it below without its comments:

```
diaco forma
cMCCFT Lotificae:
SMCFT Tombios
DBVTV Fiendipy
UBVT2 SASNIPSA
DBVTE Doguđecij
DVTE Congressi
DVTE Congressi
DVTE Congressi
NGBT *XV.
Tiruct Dyte: ******************
```

LettEdge and TopEdge refer to the position of the drawing, measured in pixels from those edges of its graphic window. I'll have more to say about this later. FrontPen is the color register (pen number) that you wish to use. There is no need to call SetAPen(), as with the primitive graphics functions. Also, DrawBorder() does not affect the current setting of SetAPen().

BackPen is currently unused by the DrawBorder() function.

There are two ways that DrawBorder() can render draworgs. The first is called JAM1. This term means two things. First, that the drawing will be reproduced using one color per Border structure, as specified in the FrontPen member, and second, that the drawing will overwrite any previously drawn graphic images.

This method effectively blasts your image down on the screen, obliterating everything in its path. Note that JAM1 does not restrict you to only one color per drawing. Multiple colored drawings are rendered by building up multiple Border, graphic structures, as you will soon see.

The second way that DrawBorder() renders drawings is called COMPLEMENT. In this mode the color is determined not by FrontPen, but by the binary complement of the drawing surface. For example, if you are drawing on an eight color, blank screen, meaning that all pixels are color 0, then your image will be drawn in the bitwise complement of 0, which is color 7. However—and this is the interesting part—if your drawing overlaps any portions of previously drawn images or text, then those related pixels will be replaced, not by color 7, but by whatever color is their bitwise complement. The following chart lists bitwise complement colors for an eight-color screen.

Color Register	Binary	Bitwise Complement	COMPLEMENT Color
0	5.82	10	
1	63	10	
		101	
2-	0.32	- Civi	
		213	
	C 100-	10	And and a strength of the second seco
3	LLV.	202	
	LIN.	000	6

The COMPLEMENT drawing mode has the interesting property that it allows you to erase your image by drawing it again! But this is an advanced concept. For now, let's stick to the easier-touse JAM1 DrawMode.

The count member of the Border description structure refers to the number of points (coordinate pairs) stored in the Borderdata-array. It represents the number of points between which straight

lines will be sequentially drawn. This member is type BYTE and therefore cannot store values greater than 255. Thus 255 is the maximum number of points that the DrawBorder() function can render from a single Border structure. Again, this is not a limitation since larger drawings can be produced by using multiple Border, graphic structures. The XY member is a pointer to the drawing's Border-data-array. In a minute, you will see two methods for declaring that array so that it properly resides in chip RAM.

The last member of the border description structure is a pointer to another Border structure. You use this member when you want to render complex drawings consisting of more that one Border structure, drawings that have more than one color, that consist of several discontiguous sets of lines, or that have more than 254 lines. In our first example, we will use only one structure, in which case this member is assigned a NULL.

The Border-Data Array

O BI - ID Wy Martail - 1

The purpose of this array is to store the pre-calculated pixel numbers of the various points of your drawing in such an order that drawing straight lines between them sequentially will reproduce the drawing. The array itself must be accessible to the Amiga's graphic co-processor chips, and therefore must be declared in chip RAM SAS/C makes that easy to do with their platform specific data type called chip.

The above array is declared in thip RAM and is initialized to the coordinates of a rectangle that is 100 pixels wide, and 50 pixels high. The data is in pixel numbers measured from the reference point defined in the LeftEdge and TopEdge members of the above Border structure. The SAS/C thip data type must be declared in the global section of your program, outside main(). You don't have to worry about returning this memory to the operating system before your program terminates; the compiler takes care of that for you automatically.

A Dynamic Solution

The above method is called static in the sense that it is fixed for only one size of drawing, in this case one having four lines Suppose you don't know, in advance, exactly how many lines are in your drawing. Quick, tell how many are in a 27-point rosette? Do you see what I mean? You could of course write code to calculate and report that answer easily enough, but in C you are not allowed to declare an array of variable size using the above notation. So even though your program is able to calculate the number of lines it needs to draw, it cannot declare a Border-data-array of the proper size to do so.

You could solve the above dilemma by declaring your Border-data-array large enough to handle any drawing that comes along, but that would be impractical. Complex drawing are rendered by multiple Border, graphic structures, and their exact characteristics are impossible to predict in advance.

The solution is to allocate memory dynamically, using exec's AllocMem() function. It requires two arguments, the number of bytes that you need, which can be calculated by your program, and a macro-specifying the kind of memory needed, in this case MEMF_CHIP. You can also use the convenient macro-MEMF_CLEAR to initialize the array to zero.

REPORTED INTERT ALALISEM PLAYER NEWF_CITE | NEWF_CLEARIN

Whether your programs are complex graphics, or data base applications, allocating memory dynamically is the most efficient way to design them. They will use only as much memory as they need, when they need it. In addition, you will be able to allocate chip memory from within different functions, not just globally as in SAS/ C's chip data type. However, this method does have the disadvantage that it is slightly more difficult to use. Your programs can often develop some difficult-to-dentify bugs. Simple errors can produce system crashes.Save your work often!

The following code declares some memory and assigns to it the same data as the above rectangle example. Note that I used 5*2 to specify the amount of memory, emphasizing that I need enough for 5 coordinate pairs.

10	3977	20	VGHLS 1 1	11
31	150	h_{2}	Free MIP	

N/2414	STATE AND AND AND THE PROPERTY AND THE PROPERTY	0.11
$\bar{\gamma}^{\mu}\bar{\gamma}=0y\bar{\gamma}$	864	
1965.4 Markt	$\frac{\partial p_{i}}{\partial p} = \frac{\partial \sigma}{\partial r} = - \frac{\partial \sigma}{\partial r} \frac{\partial \sigma}{\partial r} + \frac{\partial \sigma}{\partial r} \frac{\partial \sigma}{\partial r} + \frac{\partial \sigma}{\partial r} $	
ipires ipires =	89, ** gount (* 1) 90	
*811++ - 7)53++ -	the interest (. *)	
лрадна н Арбрии н	or (* pant 4 *)	
spini - spin	a se print 5 to	

This method of declaring the Border-data-array also gives you the responsibility of returning the memory to the operating system before your program terminates, using exec's FreeMem() function.

Linking Data to the Description Structure

For Intuition to properly execute the DrawBorder() hunction, the Border-data-array must be linked to the Border description structure representing the drawing. This is easily done with an assignment instruction. Below I give you a hierarchical diagram of what I have done so far-

		MyData	array Lp ram)
Border Str	nucture	σ.	Ŭ.
beftEdge TopEdge	= 0 = 0	100.	υ.
FrontPen DrawMode	= 1 = JAMI	100,	50.
Count XV	= 5		50,
NextBorder	= NULL	jū.,	3.

The Drawborder() Function

After performing all the above ground work, the only thing left to do is invoke the DrawBorder() function itself:

DrawBurder (my_rp. 6MyBurder x. 911

This function renders the rectangle by drawing straight lines between the points stored in the array MyData. It does this sequentially, as you would yourself if you were drawing while not being allowed to lift your pencil off the paper. To produce a closed image the first and last points must coincide.

The first argument in the DrawBorder() function is the forever ubiquitous RastPort pointer. The system needs it to determine where you want your drawing rendered, in this case the window opened by your programming shell. The second argument is the address of the Border structure that describes the drawing you want rendered. The system will read from it your specifications, as well as the actual data points that you have previously linked to it via its XY pointer. The last two arguments are an offset coordinate pair that will get added to the position of every point in your drawing.

Position Control

You have three levels of control for the positions of points in your drawing: the LeftEdge and TopEdge members of the Border structure, the individual coordinates in the Border-data-array, and finally the offset coordinates of the DrawBorder() function.

LeftEdge and TopEdge represent a coordinate pair that act as a reference for all points controlled by that structure. This level of control is used when constructing multiple Border, graphic structures, to adjust the relative positions of different parts of the drawing. The second level of control is the pixel data itself, which represents positions relative to the above LeftEdge and TopEdge. Finally the DrawBorder() offset value allows you to make one final adjustment to the position of the entire drawing. This is especially useful for adjusting the position of multiple Border, graphic images, as you will soon see.

First Border Example

This first example draws the above-mentioned rectangle. It is a single Border structure drawing; thus its NextBorder member is assigned a NULL. The example is on the magazine disk in the directory called First_Border. I list it below:

re Fitar_Bolder_c			
Faul Castoring Kinning Fintuition (Inc.) Kinning Fintuition (Inc.) Kinni		ortabor 1001	•
<pre>#intlude *SSetLb*</pre>			
59:07 c01p WyDeta/(- (- D, 0, 150, 0, 150, 77 0, 07 0, 07			
atruct border Wyburdes	 BIDNG Gett Brig Scient Tudindae Gayne Theory (* Vayne Barlier) 	4.444	

1981	1.0	VAVTE UPGWYGON	1
	10	ANTE DOGNE	+1.
VEN A	1.0	EXERT *X.	* 1.
Surf_	17	staurt Borner Mestandes	
0.005		action and an investigation	1

VOID MAIN (10) FORM, TAM PADEWILL.

VOID muje/int and; ther Amorvill

Hand Grown Thy server Proof Hendert thy synstruct window Tay sinder struct window Tay sinderstruct with port the sys

11.7500

LLI open_sheiliney_record, an inter brilline besieve fulnissenter

product("Economic is Specificati) ((ntj)

THE CALENDER FAIL OF

of concentrations and had been that a terr reconcentration of

50111 (), ... 5: (++) Drawborder: my.cp. sNydorder: 1*00, .*000,

SetAPeniay_rp: 1); Nokeiny_rp: 200, 10); YmyTry_rp: "Res(angle: viine Diav8ctore) (*_ 20);

Selay15201.

(for the second seco

Tiose_Sheling_windswimy_honewait,

This is a static solution. The Border-data-array is declared globally using SAS/C's chip data type. Notice that the drawing's Border structure is also declared globally, although strictly speaking that was not necessary. I did so in order to keep the two related declarations close together in the listing. The program contains a loop that draws several instances of the rectangle using DrawBorder()'s offset feature. What you have here is five drawings produced from a single Border, graphic structure by multiple invocations of the DrawBorder() function, each at a different position on the screen.

The next example, Second_Border c, demonstrates the same program except that the Border-data-array is declared dynamically and private to main(). Note that two new #include's were needed: <exec/memory.h> which contains the macro definition for MEMF_CHIP, and <proto/exec.h> which contains the ANSI prototype definitions of the AllocMem() and FreeMem() functions.

```
1* Second_Border; :
```

Paul Cartopauky (Cloper, 199) Include Sectoremery-A Include Sector

Finclude "Chull of

White main / int argo, that "argy(1))

VOID HELEYLAN LONGT, CARE MARRY (1)

Hitust Scient Tay_Hotbin, Hitust ViewEns Tay_Hot Htrust Window Tay_Hitusu



Rosettes Using DrawBorder()

The DrawBorder() function is not limited to simple drawings. Let me demonstrate by using it to render a rosette. Recall that I introduced the rosette early in this series, promising to use it later to demonstrate different programming concepts. It's more interesting than rectangles, don't you think?

In order to make the program capable of efficiently drawing rosettes of different point sizes, I will declare whatever memory it needs dynamically. The larger the rosette, the more memory it will use for its graphic data structures. Also you will see that the amount of memory used depends on how ingeniously we design the program.

Now, exactly how can we design a bunch of linked Border structures to represent a rosette? Perhaps we could divide the rosette into groups of lines having some similar property? Well, that could work in principle. A natural division might be in groups that connect to one common point. Each group would represent a fan pattern of lines. The trouble is, DrawBorder() draws lines in tandem, connecting points that are stored in a Border-data-array sequentially. That's great for drawing closed figures, like polygons, but not very efficient for fan patterns. The computer would have to trace back over each line that it drew in order to get back to their common point before drawing the next one. That's too time consuming.

One answer is to divide the rosette up into individual lines, making a separate Border structure for each. That's an awful lot of Border structures, but the Amiga can handle it easily. All these structures must be linked together and each one linked to four data values (two points, each having horizontal and vertical coordinates) stored in chip RAM. Sound complicated? It's easier than you think. and a good demonstration of Intuition's high level power as well. The solution is on disk in the directory Rosette2. I explain its internal operation below.

The first order of business is to calculate the number of lines in the rosette. To do that we use the same double nested loop that normally generates it, except that here we only increment a line counter:

You can put a print instruction after this loop and confirm that the exact number of lines in a 23-point rosette is 253. Next we allocate memory for our graphic structures:

```
Alltent Distance of a first transformer of a
```

The first declaration, Rosette_Data, will be used to store our pixels numbers. It is one contiguous length of chap memory, long enough to store 4 four integers per line of the rosette. The second memory declaration is for the array of Border structures, one for each line. This one need not be in chip RAM. Each Border structure will have to point to a different spot in the previously declared length of chip RAM Rosette_Data.

Now we need to calculate the pixel numbers for the points of the rosette. We use a point-array for this, for the same reason that we did in our earlier rosette examples, to keep the number of floating point calculations in our program as low as possible. Note that this is not the data that DrawBorder() will use directly, but rather the data that we will use to fill up chip memory with the data that DrawBorder() will use.

```
Received and ore point and an in-

Received a Rolston and

Received to Point (1)

Angle (2) 266,000 cm(5)
```

We then assign data to chip memory using these precalculated values, thus

```
complian with the sum of an interval of points
Defa_bit = from ( ______)
Terls = 11 + from ( ______)
Terls = 11 + from ( ______)
Terls = 11 + from ( ______)
Terls = from ( _______)
Terls = from ( ______)
Terls = from ( _____
```

```
PLINET REPERTY "My_EPY
```

SHORT "MUDATH - Will-THORT "Part / Surial County L.

ctilizen_Stelling_arean, any_arp, any_aradan, any_sp. "LACENDEDITI

```
retries.com/oper.com/oper.com/
in the retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
retries.com/
r
```

14 and a second second state and a second se

wight? - (18/w2.417)1003wil44547190011748041748041748041

```
ris ( MyGHLS)
Fgelikk ( D)
```

Apr 2 --- 1 01

*p(1++ - 10)/

```
*D(24+ = 100
```

ADDING IN THE PARTY

```
*202++ = 21
*202++ = 50
```

*24.044 - 21 *24.0

```
NyBerdrin, SY Hydria -
NyBerdrin, SY Hydria -
NyBerdrin, Sont Berdrin, Molly
```

```
TourBurgetinv_pp_AMyBurget_STM1, ADM114
```

```
Dispayed Sales and
```

Freedom (Widers, A+2+(1) and (SNCH7)).

14 community and a set of patrick community and

Sinse_Joell on_sinters or_siteroi/

Exactly what method you use to declare your array will depend on the structure of your program. If you are drawing something whose definition is known at the time you are writing the program, and which is used in several places within your program, it may be more convenient for you to use the global version. However, if you must rely on internal calculations to define points in your drawing, you will need to use the dynamic method. But even if you drawing is completely known ahead of time, you may still need to use the dynamic method. Any program that is reasonably complex should be structured into functions and have its graphic structures made local, in order that you can come to grips with its overall complexity. Program structure is not a strict rule that you must follow to get your programs working, but a feature that you should use to make them maintainable. Authors of unstructured programs lead lonely lives because no one can understand their work.

Drawings in Multiple Colors

If you have a drawing that consists of a single border structure and you want to render it in different colors, and at different locations on the screen, you have a number of choices. You could change the FrontPen member of the Border description structure before every invocation of DrawBorder(), which might then render it using different offset coordinates. Or, you could create several Border structures, each having the same LeftEdge and TopEdge coordinates, pointing to the same Border-data-array, but having different ProntPen definitions. Then each invocation of DrawBorder() would specify the address of a different Border structure, as well as different offset coordinates of course. An easy way to do that is to declare an array of Border structures, as in example Third_Border c on the magazine disk. I reproduce the important parts below

```
Short Woolan o Kolu.
Short Yang Mula
Short Le
Ligol Enrole Macader(151).
```

Ryinte = iAWBE */Alloctmi(*2*scenalShowE) ReEr, Crittin HERF, Cubini)

```
rsz i Hybelici
Apticary - Ny
"DEATHER IN
*plas- = 100/
100 Yes - 1
"plan - jon
172.00 = 50;
172.00 = 50;
April and a fight
*plate 0)
*plate 0
E89 11-671 11557 (1440)
  Hydensons [... Laft Lage
   Myerrder() Coldr
                            a Lab of different color ins each ",
   Nyhauder's Prantaen
   Myboyoty (11, Aurkley,
                Jonand
                            1.03311
   MyBorder111
   NYSOCCETT. COUNT.
                            1.30
   Millurger(1) (7
                            · WYDECU-
   W/Bordon II NextBorde - MBLL
Literate roll over
```

brashoracting_pp_ABySecretic), 4*80, 4*404

Note that in each case the DrawBorder() function renders a drawing represented by a different Border structure, but having the same pixel data. The Border structures are not linked.

Linked Border Structures

Another way to display colored rectangles is to declare several Border structures, each one having its own FrontPen color, as well as its own LeftEdge and TopEdge coordinates, and then link them all together using the NextBorder member. This is your first example of a drawing represented by a multiple Border, graphic structure. The structures are linked sequentially by having the NextBorder member of each point to the Border structure of another, with the last one pointing to NULL. This is the old linked list idea that you learn about in any computer-science data-structures course.

The big difference in this example is that only a single invocation of DrawBorder() is required to render all five rectangles. See example Fourth_Border.c on the magazine disk, which draws two complete drawings, 10 rectangles, using two invocations of DrawBorder(), each using different offset coordinates. Below I give a partial hierarchical diagram of the structure which represents the drawing (next page): The Data_ptr pointer jumps along the contiguous length of chip memory assigning pixel coordinates that represent end points of all the lines in the rosette. The last piece of work is the assignment and linkage of the Border structures:

We use a pointer, Rosette_Border_ptr, to jump along the section of memory representing the structures, assigning members as we go along. Each XY member is linked to the pixel data of its respective line in chip memory, four integers representing two coordinates on the screen. The Count member of each Border structure is only 2, meaning that each one will draw a single line between two points. The last Border structure is made to point to NULL, representing the end of the linked list.



All that done, we can now invoke a single DrawBorder() instruction

provinger of the contraction of the contraction of the

and presto, our rosette gets drawn. Like magic

Perhaps you are thinking that all of this is too complicated to be useful. To draw a single rosette? Perhaps. But what if you wanted to draw many rosettes, perhaps at different places on the screen. Once you have constructed the graphic structures, a drawing can be rendered at any time by a single DrawBorder() instruction. Example Rosette3 on disk does that, First it scales the screen such that the origin is in the center of the top left quadrant of the screen.

```
class = 1.40
common = 1.4
```

Then the graphic structures are constructed as before. Finally fourdifferent Rosettes are rendered like so

```
le ne fortele (1995), en el sente Berderin, en el sente en el sente el sente el sente el sente el sente el sente
En energi en el segui el sente el se desente el sente el
De energi el sente el sente el Berderin en sel (2000 el sente el sente el sente el sente el sente el sente el s
```

I wanted to use the Fx(1) and Fy(2) scaling functions to make the placement of each rosette easier to visualize. To do that, I had to remember that the offset argument of DrawBorder() is added, not to my Cartesian coordinates, but to the top left corner of the window in which my drawing is being rendered. The graphic data structures were set up such that the center of the rosette is at Cartesian coordinates(0,0), which corresponds to pixel coordinates Fx(0,0), Fy(0,0). To shift the rosette to a different position requires that I subtract those Fx(0,0) and Fy(0,0) terms from each new location.

Rosettes are only an example that I chose to use because they are slightly more interesting than rectangles. The purpose of all this is to help you learn how to use the DrawBorder() function. I really don't know what kind of drawing you will want to render. But whatever it is, you will probably want to build it up in a structured manner, using a different Border structure for each section of the drawing.

Another Implementation of Rosette

Although the above example is certainly a good one for showing a complex graphic structure, it does not make most efficient use of memory. The problem has to do with the repetition of coordinate values in the Border-data-arrays. You see, each line is defined by two end points and consequently each Border structure points to a four-element array. But often the beginning point of one line is the same as the end point of another. One would think that different Border structures could share the data for those common points. But the above algorithm does not take advantage of that. To design a program that does, we could divide the lines of the rosette into groups of contiguous lines, that is, lines that consist of several segments drawn in tandem. Then points that are common to two segments would not have to be repeated.

Suppose you start arone point on the rosette and draw a line to another immediately adjacent one. Now, moving in the same direction draw another line, this time not to the next immediately adjacent but to the one after that. That is, skip a point. Continuing, draw another line, this time skipping two points, then another, this time skipping three, ... etc. The result will be a kind of spiral that traces a unique path through the rosette. How many such steps can be taken by a single line? In a 23-point rosette, only 11. After that the line is no longer unique and will start drawing certain lines for the second time. However, if you go back to the point where that line started and move over one point, you can begin another similar, 11-segment unique line. And, how many times can you do this? You guessed it, 23 times! Thus you can complete the entire rosette by drawing 23 contiguous lines, each one consisting of 11 sections.

The example program in the directory called Rosette2A solves the rosette using this new technique. Its graphic structure consists of 23 linked Bordet structures, each rendering a unique 11-segment path through the rosette. The example demonstrates how ingenious methods can be used to reduce the size of the graphic structures. It also demonstrates the perils of dynamic programming. That's right, the example is programmed dynamically and will render rosettes of any size up to 49 points simply by changing the macro POINTS.

Here is the memory allocation for the Border_data_array

```
Allocate plane with them to his spo
states and the state of the spo
states plane by the state of the states of the
```

We multiply the line_count by 2, not 4, because this method takes advantage of using common points to draw contiguous lines. But watch out for the (rap. You must add 23 extra points (POINTS) because there are 23 separate line sets, each having 2 end points which are not shared. Fail to see that and you will crash your machine. Here is the memory allocation for the Border structures:

Next we must assign data to the Border_data_array.

Data (1971) (1970) (1970) (1970) (1970) (1970)

```
CONTRACTOR DURING AND ADDRESS.
 entre anderer and all more than the
                                                                                                                                                                                                                                                   Contract Action
 A CONTRACTOR DESCRIPTION OF A DESCRIPTION OF THE OWNER OF THE
 CERTIFICATION CONTRACTOR PROPERTY FOR CONTRACT, TORICO, MICH.
         A set only the point is first the set
              These graves monitor stars statistical a printing of
                Water plane - Jourton Water Hand of The Street
               perter 1, (Close) point all called an an and server
                                                                                                               in our near
               $140 mm
                                                                                                                                                                                                                                                                                                                                                                                                    36
                                                                                                     Propagation and
                            I PERMIT
                                10 mmm and an an an an and a second s
                                 Of manipulation
                                                                                                                     Consignation of Marine Constraints (1997) and (1997) an
                                                                                                                           of peak work known occurs in herder meaning ?
                                parent hill.
                                                                                                                          A lotters one size
```

```
with the sector of the sector states
```

We pick a point on the rosette, line_set, then increment by ever increasing step sizes until 11 line segments are completed (line_count/POINTS). Notice how luse the modulus operator, %, to wrap around through values in the Rosette_Points array. We then increment line_set and start the next contiguous 11-segment line.

That done, we must now link the 23 Border structures to each other, and to their respective Border-data-arrays.

```
Advances in a construction of a construction of a
second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second sec
```

Each XY pointer is linked to its respective line set. But wait a minute. Each line set consists of 11 segments and of course two end points. That makes 12 points, not 11. Note that at this point in the program, the variable "points" does not equal 11. It equals 12, exactly what we need. It became 12 when it exceeded the upper limit of the previous do loop. Tricky, eh? Each NextBorder is linked to the next Border structure, except for the last one which is assigned a NULL. The result of all this is a graphic structure that occupies better than half the memory of the previous example, yet produces the same drawing.

Programming Challenge

Is there a way to program the rosette using a single Border structure? Yes there is, but it has an upper limit. That is, there is a limit in the point size of a rosette that can be programmed using a single Border structure. Can you find it?

Think about it, you have to design a single Border structure. to draw a contiguous line that produces a complete rosette. I did not say that the line could not double up on itself, if can. But to produce the largest rosette possible, and remain within the upper limit of the Count member of the Border structure, it will have to draw in the most efficient way. Actually Rosette2A is a good hint on how to do it. Your solution must be programmed dynamically, to make most efficient use of memory, and it must be generalized to accept any POINT size up to its upper limit. You may use the simple method of defining a macro for the POINT size, as I did in this article. To test your program, simply change the macro and re-compile. If your programming skills are up to it, you may use command line arguments, or any other legitimate form of input, to enter different POINT sizes. But your solution must indeed produce a complete rosette for each POINT size up to its upper limit. It must also correctly handle the case when the point size is too high. Sorry, no system crashes are allowed.

Good Inck!

The directory called Rosette2B contains one last example, which is equivalent to the one in Rosette2A except that its Count member has been reduced by 1. Many interesting, artistic patterns can be discovered by making small modifications to the types of example programs we have been using.

Line Animation

Don't fall into the trap of thinking that DrawBorder() is useful only for static drawings. It can be used for animations as well. A good example is the Line Animation program from two issues ago. You remember that one, don't you? It drew a line that left a trail as it moved around the screen. Perhaps you were not too impressed with it. After all, there is a similar one on the SAS/C examples disk that is 10 times faster. But wait, there is a big difference. Run the SAS/C example and you will see that as the trail is removed (by drawing the last line in the background color) it overwrites portions of the remainder of the trail. I know it's moving so fast you can hardly see it, but by pressing the right mouse button you will temporarily stop it and be able to see the effect I am talking about. My version does not do that. By relying on the fast drawing speed of DrawBorder(). I was able to redraw all lines in the pattern every time the last one was removed. The effect is a much smoother animation.

I promised in that earlier issue that I would use the Line_Animation example in future articles to teach certain programming concepts, and I will, just as I did this issue with the rosette. It's just a little too soon yet for animation. In case you did not see the Line_Animation program, you will find a compiled version of it on disk this issue.

Rendering Text

You have seen me slip in without explanation a few text instructions in all the examples of this series. It is now time to say a tew words about that. As in the case of rendering line drawings, there are two ways to render text on the Amiga, a primitive way and a highlevel way.

Primitive Text() Function

The Text() function is part of the Amiga's graphics library, which is automatically opened for you by the programming shell. Here is an example of its use:

```
Swinkering_ri, 1/.
Meveneg_ri, S. Tirr
Twatroy_ri, Skip.ex, I'r soren o ownor (S.)
```

Initially you must select a pen register, and move the graphic cursor (drawing point) to the place on the screen where you want the text to appear. The Text() function itself requires three arguments. The first is the RastPort pointer, representing the window in which you want the text rendered. The second is the text itself, or a pointer to a NULL terminated length of memory containing it—more about that in a minute. The last argument is the number of characters in the strang.

Baseline of a Font

The word font refers to the characteristics of the letters used by the computer for displaying text on the screen. The Amiga has ten different fonts, with names like topaz, diamond, ruby, ... etc. They all come in a variety of sizes. In this article I will discuss only one, the Amiga's default font called TOPAZ_EIGHTY. To place text at precise locations on the screen, you must have some knowledge about the font you are using. Specifically you must know the location of its baseline, the point in its graphic definition from which it will be rendered; its graphic reference point if you will. In previous examples I have used the number 10 as a vertical coordinate in the Move() function when I wanted to place text near the top of the screen. I chose that number to guarantee that the text would appear property within the limits of the window, while at the same time not over-complicate the appearance of my code. But that was not quite correct. To place text property, I should have used the font's baseline definition.

The height of a font is measured in scan lines starting from the top of the letters. The Amiga's default font, TOI'AZ_EIGHTY, is defined in the header file <intuition / preferences.h> to be eight lines high, numbered from 0 to 7. In addition, its baseline is defined (in a different place) to be one line up from the bottom, or line number 6. But of course one should never go around using absolute numbers for such things. The user could easily change the default font, in which case the current lont's baseline would be different and the positioning of the graphic cursor in your program wrong. The solution to all this is to read the baseline of the current font from the system. It is kept in the RastPort structure, in a member called TxBaseline. Below 1 show my above example modified to do this:

Andersy is a synthesis of a second synthesis of a

Now I need never worry about the text accidentally overshooting the upper edge or the window. The exact top line of the letters will always comorde with the exact top of the window. The user can change the system tent and my program will comply by using the baseline of his selection.

Building Your Strings

Remember that unlike BASIC, there are no real string variables in C. You have to build them up yourself by declaring character arrays and then copying lead into them. Page L188 of your SAS/C documentation lists four different functions that you can use to do this, each one having its own advantages. Thike to use stccpy() for a few reasons. First, its operation is always limited to some fixed number of characters that must be specified. That protects you from the disaster (possible system crash) of accidentally copying strings that are not properly NULL terminated. Second, when sleepy(-). encounters a NULL character in the source string, it fills the remaindet of the destination string with NULLs, up to the length you specify. Third, it guarantees that the last character of the destination string is a NULL character, even if the source string is (accidentally) longer than the destination. Finally, ii returns the length of the string copied, convenient for use in the Anuga's Text() rendering function. Here is an example.

HIP-LOOP INTERNEY

tol to share at

1041 (W______) 10000 (10050 ______) 100 200 (1220)

nee e exemples, en av proposition de la complete de Normalisa de la complete complete de la complete complete de la complete d

I must subtract I from size because steepy() reports length including the terminating NULL character. Of course you may have your own legitimate reasons for wanting to use another one of SAS/ C's string copying functions, or even one of your own design

Using SprintF()

You are probably wondering how to go about displaying numeric values into a graphic window. Intuition is not like a CLI window; you cannot use the normal Standard C printf() instruction. In fact, if your program executes a printi(), its text goes, not to your programming shell window, but to the CLI (or AmigaDOS Shell) window from which you launched the program, what is called standard 1/O.

A convenient function to use for getting numeric values into a graphics window is sprintf(). It does everything printf() does, except that it sends the text to a previously declared char array, instead of stdio. It even returns the length of the formatted string produced. From there it can be easily used by Amiga's Text() function.

```
contraction and the second states of the second sta
```

wise a discontine, string, the approximation of play ktt (2.0/7.0)) Testing_app sylptony, wite()

The sprintf() function allows you to use all the formatting conventions of Standard C to build strings that you can then render into any graphics window.

TextAttr Structure

The programming shell window of these articles does not automatically support scrolling and carriage returns like a CLI or AmigaDOS Shell window. You have to keep track of where to display successive lines of text yourself. The minimum that you need to know is the height of the current font. That, after all, is what determines how many lines of text can appear on the screen, and how they should be spaced for best appearance. Font height can be read from the system by using the AskFont() function in conjunction with a TextAttr (text attribute) structure.

The TextAttr structure is defined in the <graphics/text.h> header file thus

struct TextAttr

STRPTE	1 m_Normo;	/* mann of the four */
UNICHE	64,461107	* height of the tank *!
UET TE	in_Style:	/* Intrimule Lont style to
TIRALE	TH_FIB781	(* Long preferences and flugs *)
1 -		

AskFont() is a function in the Amiga's graphics library. It can be used to obtain the above information about the current font. It requires that you previously declare a TextAttr structure in which to report the information.

```
ADDALE TEXTAGET DECAULT_APTT:
ASAFONT(WY_AP_ ADDALE_APT)
```

You can then read the height of the current font from that structure

I assign line_height to be two scan lines greater that the actual font in order that the text appears properly spaced on the screen. Two scan lines work out pretty well for TOPAZ-EIGHTY.

See the example Strings.c, in the directory Display_Text, on the magazine disk. If shows you how to use a variable, called line_number, to keep track of where to render successive lines of text to the screen. The example also contains the previously mentioned sprint#() function, reporting a floating point value to screen.

Intuition's High Level Text Function

Just as there exists a high-level Intuition, line-drawing function, there also exists an equivalent text-rendering one, called PrintfText(). Here is its operational theme:

- Declare one or more IntuiText structures to contain the specifications of the text you want rendered: its color, position, font, ... etc. I like to call this the description structure.
- Store the actual text you want rendered in a NULL terminated character array.
- 3. Link all structures and their respective text-arrays together.
- 4. Invoke the Print[Test() function.

Depending on exactly what kind of text you want rendered, there may be advantages to using PrintText() over the more primitive Text().

Some Background

All text consists of two parts, the letters themselves, called the foreground, and the background area over which they appear. For example, in TOPAZ_EIGHTY, each character is formed on an 8x8 pixel grid by illuminating certain pixels, while at the same time leaving certain others off. The pixels that are illuminated form the actual character and are called the foreground. Those that are left off are called the background.

The Amiga can render text in four different ways, described by its different DrawModes. The first is called JAM1, the same term that you saw earlier in DrawBorder(). In JAM1, mode text is rendered such that the foreground of each character over-writes any previously drawn graphics or text, but the background does not. Thus the computer is rendering in one color only, the foreground color. A second mode, called JAM2, renders text in such a way that both foreground and background over-write previously rendered graphics or text. Thus the computer is drawing in two colors, the foreground color and the background color. A third mode, called COMPLEMENT, renders text such that all foreground pixels are replaced by their binary complement. The last mode, called INVERSVID, reverses the roles of the foreground and background colors.

IntuiText Description Structure

The template definition for the IntuiText structure is in the file <intuition/intuition.h>. I reproduce it below without its comments:

```
UPVTE CONLINE
UPVTE BACKPEN,
UPVTE BACKPEN,
UBVTE DAWNCdy;
SNORT TopDoge:
SNORT TopDoge:
STruct TextAlts *TreesPont,
UPVTE *TIME:
```

FrontPen is set to whatever color register you want for the foreground of the text. BackPen is set for the background. DrawMode is set to either JAM1, JAM2, COMPLEMENT, or INVERSVID, LeftEdge and TopEdge determine the position of the text in the window. TopEdge refers to the position of the top scan line of the text, not to the baseline as was the case with the Text() function. The ITextFont member points to the structure which describes the font you want to use, or NULL if you want the system's default font. I will leave this NULL today. IText is a pointer to a NULL terminated contiguous section of memory containing the actual string that you want displayed. Finally NextText points to another IntuiText structure. You use this last member if your text consists of many strings, each one represented by a different IntuiText structure. Below I give a hierarchical drawing of a properly constructed IntuiText structure that displays a single string message at the very top left corner of the window. It uses the system's default font, color register 1 for forcground, and color register 0 for background. Us NextText member is assigned a NULL, meaning that I have only one string.

TopEday			-1
Meltinn DreeMoue LANSEBOR			

The actual rendering is accomplished by the PrintlText() function:

FIALTEST STY TRY THAT. R. WIS

... which requires four arguments, the RastPort pointer, the address of Intui Text description structure, and an offset coordinate pair that has a similar purpose to its equivalent in DrawBorder().

The example IText c, in the directory Display_IText, demonstrates one way of using Intuition's PrintlText() function to display an entire screen of text. It opens an interlace screen, enough room for 50 lines in TOPAZ_EIGHTY. It then declares a 50-element array of IntuiText structures, one for each line on the screen, and a character array called my_strung[50][80], enough memory space for 80 characters on each line. (79 actually, remember the '\0' character?) The IntuiText structures are then linked together and each one made to point to its own 80-character section of memory. The TopEdge member of each IntuiText structure is assigned a different vertical position, thus placing each line at its correct location on the screen.

Text can be copied into the character array using stccpy(). It's easy to keep track of things because the element numbers in the character array correspond to lines on the screen. Finally the entire structure is rendered using a single PrintIText() instruction. It you run the example, please do not try to read the text on the screen: it doesn't stay there long enough. The example is intended only to show you how PrintIText() can be used. It also shows how to clear the screen and the 50x80 character array in order to display new text.

nú-änce', n. a delicate degree of difference.

Typesotting quality is in the details - details often omitted for long lists of features. Details such as separate hypfiens (-), en-dustes (-), and em-dashes (-). Details such as ligatures and kerns. Details such as vertical justification and a full range of diatrical marks. But there is no longer any need to compromise (you can have all of the features and all of the quality with



Many products allow you to import PostScript graphics from any source. AnigalEX allows you to preview those graphics on the screen and print them to any printer, even dot-matrix printers. Some programs allow you to use PostScript fonts. ArmgaTEX lets you use both Type 3 and kinted Type 7 outline fonts, on the screen and to any printer. Some packages allow importing IFF/ILBM images—but none provide the variety of dithering and filtering options available with AmigaTEX.

Multi-thousand page documents present us difficulties, even on a one negabyte Amiga. Mathematics and tables are typeset with unparalleled quality. If you are serious about putting words on paper, write for your free demo disk. Move up to the quality of AmigaTeX.

> \sqrt{i} Radical Eye Software

Box 2081 . Stanford, CA 94300 . BIX: radical.eye

Circle 102 on Reader Service card

For some simple text oriented programs this may be all the screen design that you need. It is easy to set up, uses high level language concepts, and renders text extremely last. Natorally it should be structured into several functions before making it part of any application.

Next Issue

This last example demonstrates a shortcoming of all my programming examples so far, that they remain on screen for only a predetermined period of time. I design them that way in order to keep them simple at these early stages. However, in the next issue I will present the missing link that will allow us to control programs using the mouse or keyboard. The Amiga's message system

I will also present the Amigo's disk based font system and how you can use any one of them in your programs

Paul Catonguay loves to hear from readers! Please send your comments to Paul Castonguay, P.O. Box 505, EvenetL, MA 02149, Additionally, you can write to Paul c/o AC's TECH, P.O. Box 2140, Fall River, MA 02722-2140. We will forward your letters to Paul. **R**ecently, we were ordered by U.S. military officials to explain to their complete satisfaction just what a SuperSub is (as we all know, it's the best subscription deal around for Amiga users, since it includes both *Amazing Computing* and *AC's GUIDE*).

Then, a prominent Congressman wired to ask us if we would testify before a top-secret subcommittee as to whether or not we can produce a single prototype SuperSub for less than \$500 million (is this guy kidding? – a one-year SuperSub costs just \$36 – and we can produce one for *anybody*!).

Finally, a gentleman called us from Kennebunkport and told us to read his lips, but we told him we couldn't, because we don't have a picturephone.

22224

And then he ordered a SuperSub.

AC's SuperSub – It's Right For <u>You</u>! call 1-800-345-3360

List of Advertisers

Please use a Reader service card to contact those advertisers who have sparked your interest. Advertisers want to hear from you. This is the best way they have of determining the Amiga community's interests and needs. Take a mament now to contact the companies with products you want to lean more about. And, if you decide to contact a advertiser directly, please tell them you saw them in



Advertiser	Page	Number
Central Coast Software	CIV	104
Delph Noetic Systems	31	101
Great Valley Products	CII	105
Great Valley Products	CII	105
Memory Management	93	103
Radical Eye Software	63	102

Do you have a story idea for AC's TECH?

We want to know!

(Call or write the Editor)

AC's TECHIM

The Development of a Ray Tracer

Part Two: The Implementation

by Bruno Costa

In the first part of this article, some of the essential raytracing concepts were presented, including a description of a simple illumination model. This second part is dedicated to show the practical usage of that theory, with many commented excerpts of code from a real ray tracer (called "ray"), that is included on disk with the tull source code in C. Some references will be made to the first part of the article, and, although not strictly necessary, it is recommended that you try to understand that part before reading on. If you are not specifically interested in ray tracing, it may be worthwhile to examine just the object orientation sections.

The General Structure

The outline of the basic ray-tracing algorithm presented in the previous issue revealed how simple it can be. It was menhoned that what distinguishes a good ray tracer are the special features it has, besides the almost standard ray-tracing kernel. This is one of the reasons why ray tracers are not merely a lew hundred lines long. Another important factor is the code necessary for each kind of object, the various data types (like colors and vectors) and the output device drivers.

Since ray tracing needs to know some features of each kind of object it is supposed to render—how to calculate an interception of the object with a ray, for instance—additional code is needed to support each class of objects. These classes of objects are often called primitives, because they can be combined to produce much more complex objects.

Some libraries and routines are used by all other parts of the program to help in manipulating 3D vectors, colors, lists of objects, parse command line options and handle errors—they comprise the support code. Also important are the routines that communicate with the output devices (like an Infuition HAM screen, an IFF file, or a 24-bit frame buffer), which guarantee some device limitations or restrictions and also perform any necessary steps to control the hardware or software involved.

With these classifications in mind, a good organization for a ray tracer could be the one given by Figure 1. The user sees simply a front-end, called "ray," that controls the ray-tracing kernel. To do the real ray tracing, the kernel needs to call each primitive to determine some of its features, and the output device driver to show or store the resulting picture. The various small packages in the support code are called by all other parts of the program, specially to manipulate some common data types.

An important characteristic, depicted in Figure 1, is the way the modules communicate. Between each pair of communicating modules (or groups) is an appropriate interface, for instance, the user communicates with the program front-end through the user interface. Each interface can usually be described by a welldefined, limited set of function calls (with applicable parameters) and data types. This is the case of all the interfaces in Figure 1 except for the user interface, that is obviously described instead by a very complex collection of commands, options, procedures, and even the input and output devices involved.

A question that is naturally raised is how does one extend the abilities of this ray tracer, particularly how does one add a new primitive? This is a very important question indeed, since after the ray tracer is relatively stable, the most frequent modifications made on it will be to add support for new primitives. It is desirable that this operation is simple enough that even someone who is not completely acquainted with the program is able to do it, ideally minimizing or even removing the need to modify the program itself. Well, this is the subject of the next section.

Object Orientation Prelude

If you have been programming for a while—in fact, even if you haven't—certainly the words "object oriented" mean something to you (maybe "yes, they mean something I don't understand"!). "Object oriented" is definitely one of the most fashionable terms in computer science nowadays—we have objectoriented languages, compilers, operating systems, databases, user interfaces, and even ray tracers. If you say your program or product is "object oriented," people look at you differently, respectfully (even if the word does not express much to them). Well, what does all this object orientation stuff mean, anyway? A complete answer is not easy, but what most people imply when they say something is object oriented, is that it is well structured, divided in modules, and encapsulated (didn'thelp much, did it?).

As you are probably aware, modularization and structures are two of the classical tools that a programmer has in order to make his program more manageable. By dividing the program in small routines, each with its own well defined purpose, one can write big (and also small) programs that tend to become easier to fix and maintain. If you have ever written a medium-sized program in the early microcomputer BASIC's—eitherC-64, Atari, TRS-80 or Apple—you surely know what I am talking about. Most modern languages support an additional level of modularization, by allowing you to group related functions in a single module. The parts of a module that are visible outside make up the module interface, i.e., the entry points that can be called from outside. Structures allow you to collect related data in a single place, building more complex data types from simpler ones.



We can take the C language as a convenient example. In C, functions and variables can be grouped in files, and any functions or global variables preceded by the keyword static are not visible outside of the source file they are in. Usually, the prototypes of the externally visible functions (defining the name of the function, its return value, and the parameter types and their order), as well as the data types handled by the functions in that module are defined in a header file (name ending in ".h").

Typically, a structure is used to define a complex data type, that will be manipulated using a set of functions. You can think of a lisl, defined by a simple structure and manipulated by the routines addtail, addhead, removehead and removetail, for instance. So, it is relatively clear that there exists a relationship between the data type and the functions able to manipulate it. It would be nice to have an extra level of grouping that allowed us to define a data type completely, in a single place, including both the data structure and the functions that understand and manipulate it Ideally, only the functions in the definition of the type would be able to read or modify the data structure fields directly-everyone else would have to call these functions to do it. This would allow the real data structure organization to change at will-as long as the manipulation functions are modified accordingly-without the callers ever noticing it. Well, programs that use this extra level of modularization are usually called object-oriented programs.

I have purposefully avoided the use of the object-orientation jargon, so that uninitiated readers could understand the preceding discussion. The data types defined by a module with an internal data structure and some manipulation functions are generally called objects. The manipulation functions are called methods. The methods and the data type define in fact an object class, and each individual object belonging to that class is called an object instance. For example, the object class BALL might define objects that can, according to some kind of semantics, roll, stop, or kick (the three methods that can be applied to BALLS). Both a small red ball and a big blue ball are distinct instances of BALL, and both can be rolled, stopped, or kicked using the same methods defined by the BALL class.

There are additional concepts that are important to achieve the exceptional level of encapsulation that truly object-oriented programs have, most of which are tricky to implement using a language that is not object oriented (like C). Probably the most important of them is inheritance, the ability of one class of objects to inherit properties of another class. This allows one class that is a particularization of another to use all the methods that were defined for the more general one. A good example is a class SHAPE, with the methods rotate, translate, and scale, and subclasses that inherit the properties of a SHAPE: CIRCLE and SQUARE. Thus, besides using the methods particular to the CIRCLE class (setradius, for instance), it is also possible to apply a translation, for instance, to an object of the class CIRCLE —after all, CIRCLEs are SHAPEs, aren't they?

Practical Object Orientation

As you can notice by the previous example, object-oriented techniques are particularly suitable to describe graphical objects, and that is precisely what a ray tracer needs to do. A ray tracer manipulates graphic primitives, like spheres and polygons, to which standard methods like intercept and normal are applied to obtain the necessary information to render a picture. Each kind of primitive has some very specific attributes, mainly related to its geometric shape, besides those that are common to all primitives (like color and surface properties). This is a typical case of inheritance each kind of primitive is a class that inherits the attributes and methods of a general OBJECT class.

You should be convinced by now that using object-oriented techniques to write a ray tracer seems like a good idea. A fully object-oriented language would be the natural way to go, but is it really required? Truly object-oriented languages are sometimes too different from what you are used to, introduce some inefficiencies and are not widely available. Hmmm ... would it be possible to implement some of the nice object-oriented ideas using the language of choice of nine in 10 Amiga programmers? With some restrictions, the answer is yes

Since C is not an object-oriented language, there is a slight overhead in using object-oriented techniques in a program. Due to this small inconvenience, the only place where object orientation is used in "ray" is in the object interface, where it is successful enough to make this overhead negligible—you will notice why. So, "ray" is not a fully object-oriented program, just like C is not really an object-oriented language.

In "ray" there is a general class, called Object, that allows every kind of primitive to be treated similarly. The ray tracer kernel, for instance, deals only with Objects—it simply does not know what kind of Object it is really rendering. This class supports all the methods necessary for a primitive to be ray traced, although each particular kind extends an Object with attributes particular to its geometry. An Object in "ray" is defined in object.h as:

(vperiot state) Lintlinds c_pade; objityme c_pade; Color o_boloe; Diamo_ligan; mad fo_dati; Pader;

where objtype is an enumerated type that lists all the possible subclasses of Object:

istmiclicrum ; Obs_spices. OBJ_20045. OBJ_20045. Obj_20045. Obj_20045. Obj_20045. Obj_20045. Object.

An Object thus contains: a node sub-structure to allow the object to be linked to a list; an identifier of which type of object this instance is; the color of this object; the illumination characteristics of the surface of this object; and finally, a generic pointer to data particular to the type of this object. You should notice that fields in this structure, like color and illumination characteristics, are attributes that every primitive, regardless of its particular type.

will inherit. The extension to the Object class is made through the o_data generic pointer, to which each primitive can link any special data it might need. For instance, in sphere c the Sphere type is defined as (basic types like real and Point are defined in global.h):

```
typedef siruct (
    Point s_center,
    real s_radius;
) sphere;
```

When a sphere is created, an Object and a Sphere structure are allocated and initialized, and a pointer to the Sphere is placed in the o_data field of the Object. No one—except the methods defined in sphere.c - knows what is stored in the o_data field, i.e., no one knows that it points to a structure made up by a Point and a real. This is information hiding: if, for any reasons, it is necessary to change the Sphere structure, no one—except the methods defined in sphere.c—will need to change.

This is how the attributes of the Object class and its subclasses are stored, and how inheritance works in "ray." More important than that is how it is possible to have a consistent, essentially primitive-independent way of accessing the crucial characteristics of an object to be ray traced.

Attribute Manipulation

When an object is created, the fields in the Object structure, and specially the data pointed to by the o_data field, are initialized with default values. Since the value of these fields is what effectively distinguishes two instances of a given class, there must be a way to modify and retrieve them. Instances of the Sphere class, for instance, are always created with center at the origin, a radius of 1 and a diffuse white, non-reflective, nonrefractive surface.

It was mentioned that only the methods in the subclass implementation know what is stored in the o_data field, and so, only a method in the subclass can possibly modify these attributes. Also, since there is no limit on the number of primitives implemented nor in the number of attributes they support, the process used to modify attributes must not depend on these.

We want the user to be able to modify the attributes of an object in a controlled way, still keeping him unaware of what is effectively stored in the structures. If, for any reasons, we need to radically change the format or kind of data that is stored in the object, we would like to be able to have the opportunity to map user requests in the old format to the new one, and also hide the internal fields that are meaningless to the user.

The obvious solution that meets most of the above criteria is a pair of methods, *attrset* and *attrget*, that are used to set and get the values of attributes. The attribute that is to be read or modified must be identified by a code, and this code is given by the enumerated type attribute, defined in attributes.h as: As is relatively obvious, this definition is not self-contained, since most of it is included from external files. This is done to make the addition of new primitives easier, reducing the number of modifications required in attributes.h to one. A file like sphere atr looks like (stuff deleted):

```
ATTR_LIST_SECIA
```

SPHERE_CENTER + ATTH_CUSTIM, SPHERE_RATION, SPHERE_RIMATTR

ATTR_1187_END

where ATTR_LIST_BEGIN and ATTR_LIST_END are macros defined in attributes.h. The attributes common to all primitives are defined in common.atr.

Note that the first custom attribute of each primitive is initialized to be ATTR_CUSTOM. This technique results in a unique integer code for each attribute applicable to a given primitive, but custom attribute identifiers of different kinds of primitive may (and in fact they will) be equal, as is shown in Figure 2. Note also that the last attribute of each primitive is usually primitive_NUMATTR, and this will be exactly the number of useful attributes for that primitive. In a Sphere, for instance, there are six attributes that can be used (SPHERE_NUMATTR = 6): ATTR_END, ATTR_COLOR, ATTR_TEXTURE, ATTR_ILLUM, SPHERE_CENTER and SPHERE_RADIUS.

A question that is still remaining is how we will be able to define a function to set an attribute of an object, if the type of the attribute is not known. A good solution is to use the ANSI C variable arguments-passing facility.

Variable Arguments

One of the best known functions in the C standard library is printf(). There is something special about printf, besides the frequency that it is used in normal C programs: the fact that a variable number of arguments can be passed to it. If you have ever tried to write a printf-like function, you might have stumbled on a shortcoming of many programming languages: most of them do not give you the means to write functions or create modules that work just like the standard library ones do. There is simply no way, in standard Pascal (is there really a standard?), for instance, to write a function that can receive a variable number of arguments (like Write() and Read() do) or an argument of any type (like New() does). This kind of contradiction prevents the use of the language in question to write its own standard library (forcing the use of another language, usually assembly), reduces the portability of the language implementation and frustrates programmers trying to write code that looks like the standard they are used to.

One of the nicest—and also one of the least used—features standardized by the ANSI C committee is the variable argumentpassing feature. It allows a routine to receive any number of

(ypedet onum) ATTR_END. #include "common.atr" ATTR_CUSTOM. #include "sphere.atr" #include "plane.atr" MITR_CUMPT ATTR_CUMPT) actributo;



parameters of any type, just like printf does, and to retrieve the parameters from the stack in a standard way, independent of the particular machine architecture. This feature is implemented as a single type and three macros, defined in the include file stdarg.h:

```
while you work, tractile atoms in white the
sound waggers (souther source)
type waggers (souther source)
```

To use it, you must declare a variable of type va_list, that is used to keep track of which parameter we are currently in. It is initialized by a call to va_start, that receives the last fixed parameter in the function. A call to va_end must be made after the arguments have been used, in the same function that called the corresponding va_start. To retrieve the current parameter and advance to the next, va_arg should be used. It receives the type of the parameter expected, and returns its value.

The best way to understand this feature is with a simple example:

```
number = reference for maximum of a
normality = reference for maximum of a
segment of protective informed plumeants
for maximum for an oral
of maximum for an oral
of maximum for an oral
of maximum for
all for all for
all for
all for all for
all for
all for all for
all for
all for all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
all for
```

There must be at least one fixed argument to initialize the va_list, and the argument list in the prototype of the function must be terminated by "..." to indicate that there is an unknown number of arguments following. It is very important to keep in mind that there is no way to know how many arguments, and of which type, were really passed to your function, so you must provide an alternate way to get this information, either implicit or explicit. In the function above, the type of the arguments is implicitly assumed to be integer, but the number of them must be explicitly marked by the user by terminating the argument list with a zero:

*******	1.7. 18	1. 7.1	0.11	1.0	120	
THE PARTY	110, 11	9- II	10.61	18.	WRIDNELS	
1.283(10)	19. 7.	919		1.8	WRITING F	÷

In printi(), the number and type of the arguments must be explicitly listed in the format string, telling the function the type of each parameter, and the order they are received. The only problem with this explicit user cooperation is that sometimes he/ she might write a format string that is incompatible with the number or type of the arguments really passed, and ... POOF! the program doesn't work any more, usually with the most bizarre effects.

These strange reactions from the computer are due to the way variable arguments are implemented in usual computer architectures. Arguments are passed in the stack—roughly, a memory area that grows either toward increasing or decreasing addresses—one next to the other. A va_list variable is simply a pointer to a place in that area, which va_arg moves by an amount that is the size of the argument retrieved by it, so that it will be always pointing to the next argument. If, for any reason, the type of the argument passed to va_arg is wrong or the arguments have just ended (and the function doesn't know), va_list will be pointing to the wrong place, usually an address that stores just garbage, and the values returned from subsequent calls to va_arg will be plain nonsense. You can imagine the rest.

You might have already guessed how variable arguments can be used to implement the attrset and attrget methods. To set an attribute, for instance, the method has to know which object is to be modified, which attribute will be changed, and the new value of the attribute. Only the type of the latter can vary, depending on which attribute is being changed. Thus, somehow there must be a way to associate each attribute identifier to its type, so that the method will know which type to remove from the stack. This connection is made through an array of types indexed by the attribute identifier, that will be present in each primitive. The possible types, defined in attributes.h, are:

```
Expendes enter (

TYPE_INT, (* Integet argument */

TYPE_HEAL (* real orgument *)

TYPE_PTR, (* permut ofderes) */

TYPE_YOID (* unused argument *)

Attricipe)
```

The type array for the sphere is (from sphere.c):

```
TYPE_VOID /* Always bogin with TYPE_VOID **
```

1. m		
* Common at:	1254) 03.	
TYPE_PIR. TYPE_PIR. TYPE_PIR.	(* ATTR_CULOW (Celos *) * ATTR_TEXTURE (Texture *) * ATTR_ILLUM (11)um *)	3
* PELVATE SE	ctibutes	
TYPE_FTR. /	* SPHERE_CENTER (Po(D) *(*) * SPHERE_RALIUS */	

You should note that there are six items in this array, one for each of the six attributes that are valid for Spheres, and that they are ordered just like in Figure 2.

Since we are using variable arguments, the attrset and attrget methods can be designed so that they set or get more than one attribute at a time. This is easily done by defining the functions according to the following prototypes:

```
int ottrier (dbioet tob). ...
```

Following the object to be manipulated there is a list of attributes and their values, terminated by an ATTR_END, for example:

```
Color white + 1110, 1.0. 1.0;
whither (ApH,
SPHERE PADING, 7.0;
ATTR_COCOP substant
ATTR_COCOP substant
```

In the case of the attrget method, the arguments are pointers to the variables in which the value of the attributes will be stored:

```
Color color:
teax s:
affred (aph)
SPMERS_PACTNE. 4s.
ATTR_COLOR, winlet
ATTR_COLOR, winlet
```

Looking at the array with the types for the sphere, you can determine the type of the value that goes after each one of the attributes, e.g., after a SPHERE_RADIUS there must be a real, an ATTR_COLOR must be followed by a Color pointer, and so on. Don't forget that in the case of attrget all values are pointers, in such a way that values can be returned in the area pointed to by them. To better understand this, you may associate attrset and attrget to printf and scanf, respectively.

Methodology

As already mentioned, the two fundamental methods that the Object class must implement are intercept and normal. Both of them depend entirely on the kind of object in question: the Object class simply doesn't know how to calculate an interception or a normal without knowing that the object is in fact a sphere or a plane, for instance, and this will be the case of most methods in this ray tracer (well, currently all of them). So, to implement this, the intercept method in the Object class could have been written as something like.

```
inter an approximation of the transmission
inter a second second second second second
second second second second second second second
second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second se
```

There are, however, better ways to implement the above, that will group all the information related to each kind of primitive in a single place, instead of scattering it through many parts of the program. Each subclass declares all the properties it supports in a structure that is the only thing visible outside of that subclass implementation. This structure is defined in properties h as

```
ID = 12 = for the second ```

The above structure declaration is the kind of thing that really shocks C neophytes—well, admittedly, even seasoned programmers need to take a deep breath before trying to write such a thing. A rough translation: each of the first seven lines declare a pointer to a function, to C code that can be executed. The fifth line, for instance, declares a field named op\_intercept that points to a function that accepts two parameters, an Object pointer and a Line pointer, and returns a real. A call to one of these functions using the pointer looks like

```
- Construction of the product of the back of the second ```

In essence, each of the function pointers in the Properties structure is a method, and each primitive declares a Properties structure where each field is filled with the appropriated function that implements that method for that primitive. In the sphere class, for instance, there is a Properties structure named sphere_prop that is globally visible, and it contains pointers to the functions that implement (hose methods, which are not directly visible outside. From sphere:c (stuff deleted)

and the second s	
reference in the second s	
namen or a more present the second	
A set to play a set of	
anterior on outstand commendation	

In this way, all the information on the methods for each primitive are grouped together, and easily accessible by the Object class. Better yet, the Object class can have an atray of Properties directly indexed by the type of the object, like in object.c:

```
All and a second and a second ```

This allows the intercept method of the Object class shown before to be rewritten in a more concise way, that is also much more efficient and independent of the currently implemented primitive types.

```
the other stations for the first state of the
```

Obviously, the methods pointed to by the fields in the Properties structure are in the code of the primitive in question, so they know everything about it, including its geometry and what kind of information is stored in the o\_data field

Let's get back to the definition of the Properties structure. There is one last field that was not yet mentioned, op\_attrivpe. It is simply a pointer to an array of artribute types, exactly like the one shown in the Variable Arguments section. You might still be wondering what each of those methods in the structure does, and why they are there. The methods are

| op_create    | used to create an instance of a primitive of a<br>particular type (allocates memory and initializes in  |
|--------------|---------------------------------------------------------------------------------------------------------|
| op_destroy   | simply destroys a given instance of a primitive,<br>freeing the memory used.                            |
| op_normal    | returns the normal of a primitive at a given point<br>(assumed to lie on the surface of the primitive). |
| op_color     | returns the color of an object at a given point (also assumed to lie on the surface).                   |
| op_intercept | returns the interception of a given line, in parametric form, with an object.                           |
| op_attrset   | sets each of the requested attributes of the object to the corresponding value given.                   |
| op_attrget   | returns the value of each of the requested attributes<br>in the corresponding value pointer.            |

Each of the above has a corresponding method implemented in the Object class, like the intercept method already shown. If you look carefully in object.c, you will notice that all of the methods implemented there simply forward the requests to the appropriate subclasses that know how to handle them. You might be thinking what may be gained by introducing functions that do essentially nothing. Look at the following piece of code:

It may look surprising, but the code above does work in "ray," actually as a result of the object orientation techniques just described.

#### The Ray Tracer Kernel

The ray tracer itself is quite simple, and it is completely contained in the file ray.c. It is basically the algorithm presented in the last issue, with additional functions to compute the Whitted illumination model (local()), the reflection contribution (reflect ()), the transmission contribution (transmit ()) and the shadows (obscured ()). A single ray is recursively traced by raytrace() and illuminate(), and raydispatch() traces all the rays in a picture, sending the results to the device driver through the routines picture.c.

You will notice that the main() function in ray.c calls two world manipulation functions, wbuild() and wdestroy(). These functions are in input,c and are used to build a world (containing all the features of the scene, including the objects and the lamps) from a ray scene description input file. If you look carefully at the code in input,c, you might observe that it depends not only on the types of primitives currently implemented, but also on the attributes they support. But wait! Isn't this exactly the kind of thing we were trying to avoid by using object orientation? Er... yes, but you'll see why.

In this case, there were essentially three alternatives. The first is the one currently implemented, where the knowledge of the primitive types and their attributes is not completely contained in the primitive implementation, making the addition of other primitives somewhat harder. The second one would be to create an additional method for every primitive, that would read its parameters from a given file. In this way, the wbuild() routine, instead of reading each of the values and passing them to the primitive, would send the entire line to be processed by the primitive. Unfortunately, this method would make the primitives dependent on the kind of modeling interface in use (scene description file), and would make it impractical to change the program to run under an Intuition interface, for instance.

The third one would be to simply ignore input, c and use the routines create(), destroy(), attrset(), attrget() and raytrace() to model and render scenes directly. This is by far the cleaner and simpler solution, but it introduces the drawback of needing recompilation every time the scene is changed. Also, one executable is needed for each scene, and, unless "ray" is made into a shared library, the code for the ray tracer and the primitives will be duplicated in each executable.

The initial idea was to support the programmabc interface to model scenes, but it became somewhat awkward to use. The scene description file was then created to provide an easier and faster way to model scenes. With few changes, it is still possible to use the programmatic interface, simply by discarding input, and writing two substitute routines. wbuild() to create all the necessary objects, and wdestroy() to destroy them. It may also be possible, if carefully planned, to use the second solution in a way that is less dependent on the kind of interface, maybe creating a method that maps a string to an integer ID (the string "ATTR\_COLOR" would be mapped to the number ATTR\_COLOR).

#### Food for Thought

The alternatives above and the idea of changing the interface used to access "ray" create interesting possibilities of an interactive version of the program or a ray tracing shared library. Although textures are not implemented, the colorat() routine was designed specifically to support solid textures easily. Refraction is not implemented, but the rest of the program is prepared to handle it, and the basic theory was explained in the previous issue. There are various illumination models out there, which create truly realistic effects. Ray tracing time can be substantially reduced by many existing acceleration techniques. New primitives can be added easily (step-by-step procedure explained in template.c), and this fact alone can be the source of hours of entertainment (and debugging!).

In brief, there are lots of things to be done. If you have the time and the will to explore this package, I hope that you learn about computer graphics and programming in general as much as I did. If you want to delve into more advanced algorithms, try the bibliography listed in the last issue, and if you have any problems with this implementation, you may try to reach me on Internet as bruno@brincc.bitnet or through AC's TECH. I hope you have fun!

#### Acknowledgements

I would like to thank Gilberto Kamikawa for introducing me to the Amiga and always providing all the material support. Very special thanks go also to Lucia Darsa, who, besides developing this ray tracer with me (all the way from the start) and providing indispensable support in the writing of this article, helps making my life such a great pleasure.


#### by Dan Babcock

Floppy drive access is usually performed via the trackdisk device module of the operating system. Trackdisk provides the same consistent, high-level interface as other device drivers in the system, and has been optimized internally for speed. Given that, there is usually no reason not to use trackdisk when multitasking normally. Special non-multitasking applications must, however, resort to programming the hardware directly. The purpose of this article is to present a set of easy-to-use routines for performing floppy access without the aid of the operating system.

#### Using the Routines

The disk I/O package (Listing 2) consists of six major routines' Read, Write, MotorOff, Inquire, SeekZero, and Restorel leadPosition. Read and Write perform the actual disk operations. MotorOff turns off all drive motors (Read and Write automatically turn them on), and deselects all drives. Inquire tells you what drives are present in the system. SeekZero sends all drives to track zero, placing the drives at a known position so that seek operations are performed correctly, while recording the previous track location of the drives in the DISK OldTrack field of the DISK Data Area global data area. SeekZero also does the favor of setting up the relevant CIA data direction registers. Restorel leadPosition steps the heads to the DISK\_Old Track tracks, previously recorded by SeekZero. The register inputs and outputs of these routines are summarized below. Note that there are absolutely no restrictions on any of the parameters: for example, the buffer pointer may point to an odd address in last RAM

#### Read

- Inputs
  - DO.L length (bytes)
    - D1 L offset from start of disk (bytes)
    - D2.L drive (0-3)
- A0.L pointer to user buffer Output

D7.L - error code (zero Il no error)

#### Write

#### Inputs

DOL - length (bytes)

- D1.L offset from start of disk (bytes)
- D2.L drive (0-3)
- A0.L pointer to user buffer

NOTE: The write routine offers a verify option that may be enabled by changing the VERIFYFLAG constant near the beginning of the listing.

#### Output

D7.L - error code (zero if no error)

#### Inquire

#### Output

D0,L - drive map - example: 5 (0101) means drive 0 and 2 are present.

#### Other Routines

MotorOff: SeekZero: RestoreHeadPosition:

#### No Inputs or Outputs

Some set-up work is required before these routines may be called. The DISK\_RawBuffer and DISK\_DecodedBuffer fields of DISK\_DataArea must be set to point to free memory areas of size 14,716 bytes and 5,632 bytes, respectively. The DISK\_CurrentTrack entries must agree with the physical position of each drive; you must call SeckZero or otherwise assure that that's the case. You should normally also call Inquire to find out what drives are installed. After completing this set-up, Read and Write may be called freely to perform the actual job. Read and Write make few assumptions about the state of the machine, and take care not to drastically alter it. This permits use in a wide variety of "hosfile" environments.

#### Drive Specifications

Almost every veteran Amiga user has experienced the frustration of a program (usually a game) absolutely refusing to load. When it comes to disk drives, playing fast and loose with the manufacturer's specifications almost assures that your program will

fail to work properly on someone's machine. For your convenience, the most critical specifications are listed in Table 1. In addition to head stepping considerations, take into account variations in drive speed, which appear at the programmer level as a variation in track length. Write a gap of 1,660 bytes to ensure that the track is completely erased, and plan for the gap to be that large when reading. That translates to a read size of 14,716 bytes and a write size of 13,628 bytes. The read size is one sector (1088 raw bytes) larger to ensure that 11 complete sectors are read. These numbers are used by trackdisk (and these routines), and your application will work just as reliably as trackdisk if you use them too.

#### Table One

| Step rate         | -3ms* |  |
|-------------------|-------|--|
| Settle time       | 15ms  |  |
| Post-write delay  | 2ms   |  |
| Side select delay | 1ms   |  |

"4ms when looking for track zero

#### Inside the Routines -

Some key facts about the internal workings of the disk routines will be mentioned here. First, the blitter is not used for encoding or decoding. Using the blitter would speed things up, but would make the routines less general purpose. As it is, decoding a track takes about 16 milliseconds, and encoding a track takes about 66 milliseconds (on a 68000/68010 Amiga). The decoding time is hardly noticeable, but the encoding time makes writing seem a bit sluggish. Secondly, the CIA timers are not used to implement the necessary delays; rather, the delay is based on counting a certain number of horizontal scan lines, at approximately 63 microseconds each. This approach leaves the timers completely free for other concurrent uses. As you can see, the design of the routines facilitates a simple drop-in inclusion into almost any program, requiring very little external support.

#### Taking Over Gracefully —

For testing these routines in a normal (multitasking) environment, it is desireable to take over floppy control functions from the operating system. The OS-friendly method of doing so is to call DR\_GETUNIT in disk, resource. Once permission has been obtained, our routines may directly access the disk hardware without fear of interference from the operating system. Of course, normal multitasking rules must still be obeyed. Listing 1 shows a program that demonstrates calling DR\_GETUNIT before making use of the low level disk 1/O routines, and cleaning up afterwards.

#### This is Not the End -

The disk routines are not presented with the intent to be the "last word" on disk routines. Rather, they are a very useful starting point, you don't have to reinvent the wheel. You are encouraged to make your own special improvements, of course and, we hope, share the result with everyone. I've already incorporated the disk routines successfully into VBRMon (see last issue's article), and no doubt you will find your own applications.

#### Recommended Reading -

The Hardware Reference Manual is the official guide to programming the hardware, and should always be consulted first. The standard Amiga disk format is documented in the Rom Kernel Manual: Libraries and Devices. I found Abacus's Amiga Disk Drives Inside and Out to be quite helpful, though it contains many errors. Lastly, Randell Jesup's "More on Low-Level Disk Access," published in Commodore's AmigaMail, contains many very helpful tips.

#### About the Author

Dan Babcock is an electrical engineering major at Pennsylvaria State University and an avid assembly programmer. Contact him via Internet as d6b@ecl.psu.edu.

#### Listing One disk.s

(diakis - Forkage for investments the standard tracking (area) without the Ci

(Topysight in 198" by Day Babbook

Thereas the plat ner is follows.

:Not reading: (Desiring reas : Wead :V0.1. - Leasth (Dyters) (D).L. - Office (Syter) (D).L. - Office (Syter) (D).L. - Syter

cher aglicing (Acutome comple Apple (Same parsacters at obeye

NAME, Encon role returned to DV 1 - 0 18 day, alad terms

| CONTRACTOR PERSONN |       |
|--------------------|-------|
| him wohld merel    | 1000  |
|                    |       |
| DERIVA SILTERAL    |       |
| DISL_WEYD-         | 8/270 |
| DITE_Pad/eader     | 1000  |
| DISK-Badder #      | 200   |

| (he)  | 26.1 | 11111  | G         |      |
|-------|------|--------|-----------|------|
| 0.753 | NE   | itel?  | invested. | 191  |
| 1101  | U.U. | 01.078 | m ôr      | equi |

iedditumai roclarea Monosill - Sera JF eil drare notosa Ilmielle - Tiolical elat octore are lo the eyeten Selloni di sic nag al Ch checkier - aind al draves consoch pero

| HERICLEONAUTONI - | ATST OF THEM FOR | DEEATON (Deloce | SackZero! poultin          |
|-------------------|------------------|-----------------|----------------------------|
|                   |                  |                 | Construction of the second |

| -       | ~ 0.085 | 1617.301 | P DATABELY | 15.  |         |
|---------|---------|----------|------------|------|---------|
| TRIFTIN | -14     | - T      |            | -1.0 | Verviy. |

|       | I PMC- | lahr-    |
|-------|--------|----------|
| steps | 000    | -34X24.5 |
|       | SIDC   |          |

| 004     | abia I.   | 18.5 T | - | Roll and the second |        |
|---------|-----------|--------|---|---------------------|--------|
| - H. R. | 101018-21 | 1997.0 | - | L 10-V              | 240.04 |
|         |           |        |   |                     |        |

| class           |         |      |
|-----------------|---------|------|
| Nurtinet. (uit  | Sec.    |      |
| HER TRADUCT     | 1.00    | 1.1  |
| DIR Scodedanter | -       | - 11 |
| D167_1_Invisor  | 100     | 1.1  |
| Pirk_Size       | T1/voit |      |
|                 |         |      |

GRA.P NEWS STREET. T line w READO votrest a 1014 Rat istilt vertare 1 Blink (m) Digit Int. potries 11 EDALL? Servizion. VOLVER TR Rentores Direction - wifer of WH.W DISH Devalues: 826 1 4,10.1 5-1 .Resources - elfone \_6 concidential ten - rillion 12 30.3 deu.b 16 coldynam - million of violes Thus us a nublic value, but us in NOT mains to be char guilt. DISC\_RAWBUTELIE 14/16 equ. CIARDED. \$07.0100 100 C424pp-4 200 1171 ciandozh 1970 1200 receddre egu coment t -----important will parameters, summary) step rite and the open looklog for Inial Strey. Settle (time) 1980 Fortiwrite deley: Jon fide relace dehave law International and a second and a second seco 30361 SINCE. d0-d=730.42133-311 mp. noved 10.37 18.5 USA DATAMAN DEPT. i culo-cu, ali mintro 1 miliyes ( Locality Call, 43 31.31 maye.1 30,37 u83.1 8 103 1.10, dl. ing 1 Blu-s CTTO: TOU IS I 6, 60 Second Realie nove.1 19.47 more\_1 2.27 Final opp make ( 40,30 101P11/jdl 01.001.6 107 m 10 273-2 P TUYE. 31.54 1.10.00 -25 ide to byle allors this thank 44 SWIC DHY D Lock! Reading round in the DHT. ran. L 5.00.10 1074 NO. FILE\_04moded\_0121111151.30 00010 Sk, nil a disesting and a dise 10210 38 143.1 104.40 pairs i manage of bycon that could be characterized burn that that still a number of system left to the annual notices. -mp.1 125.08 beint Thinking 17-1 mab. . -d42-d5 mente il 11,000 tor. Origi Med 483-5 700. mV 613 5 nearth p

FIGHTON NOV 1 ca a. bes! rune number of Dyene off in estare Gey effect Here's an an inner the repower! with . 101-X\_10014c+=++c+=-1/ 101101 478.1 Second Strikes DEALST LABOR 19 22 10-1 Solis in 500ss all dick really doepn't per pet dovid \_\_\_\_\_\_\_ mayney 1 while a 17.00 HM take Geardeni old daven-92 E bolii 815 1841 IDDAY DO ac and there drive the Pulle drive to the test to the BC (F BORF. W ingent include muye. L P. crossingal history whet's such and Enddy 201.1 OPport INIT ISI 100.00 Deg (F 10 05 ibr o Senti i poynt ( 10p11.d0.d2 1.52 1961 LOVA WILL designation visco, just a grant and drave tunger in tare dity for poten catho in wild two where - i either the compart space panets or the dominance of invaria, where Lobo ma Arment 1 1164 48 339.0 DUT 1.7703 Int Fast 1004 No.1411 THE NO SPORT pres . 10.03 bre.e. DX10 DIOP5 Ryfield tion on Lover style.b OLD\_CONTRACTORY AND ALL MILLER isr.s 15,57 \$0.\_dil. -DOC N Stret bure,b DIER\_CONFERNS LEGISLATION .... 11.23 180.0 Evenuel i THE OF COLT TIME TRACKS which. they at upp (1.014), Typen(11) and 5. personation (1005) to The Complete France (1005) £81.-8 - 0011 81,1241 DOL: 5 may b 201 80,5811 80,5211 ENV MAIL tixet 80.1011 211 8 orlde! tobe.A 10,21 202 Step10 2017.22 distance: Impressed of mire Marrie 10. WELLAN! 111.01 .Ehd DOL-11 litrat. ACIDO SANCHA Diver 1 101.0 0010011 dia area Print. 815.00 324.0 01541

| Gaint               |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| delays'             |                       | and the second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 105 A. 11 VI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | 200111                | 142                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ST. P. A. St. Alex                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | - N. L                | 101.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 100000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| - Addition          | active and            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2017.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Constant processing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | THE CONSTRUCTION OF A DESCRIPTION OF A D |
| 01243421            | 1000                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Digrow.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Windon thing on                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | mean synnadime                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                     | See 151               | Part of the second seco |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 10 - 2 - 0 M                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | and on A              | PA IN- IN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1.0.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| dation 1            | 27.3                  | 0.010                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| COLUMN 1            | -                     | and second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | and the second second | AND 40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Jackwin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | with the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 10.6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| of the later of the | 1000                  | 8.0 11 00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| I COLAT IN          | · A company of the    | I Charles and and the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0.0 11 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Carlot as           | the party is to       | and freedom and a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | mark -                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | April 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | TRACTING.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | contrast, St.         | ubconvertine)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1.00.000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 100 C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | The second            | 1700au/11011-01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | 007.9                 | LT.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Lenne 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | Orro                  | dir                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | and the second second second second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | 100                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | TOPS P. Security and Large                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | al con                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                     | 209                   | -31                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | -1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                     | 21.2                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Contract And American                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | and a little and a little and a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ADGUARD MARKEN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| (stillers)          |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | North L               | 2010_secular(al) a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | a cgr laws                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | 2034-0                | 10/00.10/00/val1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | a the criters have                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Law                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | - 0 <sub>1</sub> . 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | -1200 P. H.           | ALTER AND ADDRESS OF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | AND ALL OF THE STREET                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | PROOF M               | about Second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Ph.475.8 (111) (000)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 10-L                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 150                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | 1079.0                | 1141A (Datamental)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | and a contract of the second second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 100.0.20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | with the state has been                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | 10000 L M             | Manna, D.C. 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | LEVER (MC 41)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Acres (Color                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 10.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | B107-06               | 101 (000) 100 Hold (000)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1 - 1 - C   1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | mart                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 10.02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | CC.                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 141                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | - manho                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | monaste como s la altra-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Eduction            |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | with the second second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Construction of the second s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| South State         | when these            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 10 m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 182 000             | ayo sare              | Same and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ALC: NOT THE REPORT OF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1.02011.021                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 101 000             | And and all           | e antis -friedren                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | All and the second seco | samh or lourdan.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                     | NO.                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | and the state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | manual 1              | DAMA REPORT AND ALL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | conservation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | and the second sec                                                                                                                                                                                                                                             |
|                     | 1964 10               | KITCH DAVID TO BE AN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | and the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | and the second second second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | A Record Com                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                     | 100 14                | AND COMPANY AND AND                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | - 81000 #                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | (7-0) (Showing)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Constraint.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Only's              | COLUMN A              | Village and a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | Enc. A                | Annual                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 10111111111111                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | And the second s |
|                     | 1770 A                | and starts "                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | and American                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | And Street.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | finite.               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | the Construction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | all a day                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | ecology               | Ran Las, Ministerio di                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | A MUREE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | (mag                  | 10.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | South All                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | 111                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 298.000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Court 1             |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Direk .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | call of the           | 114407 LL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | calicom.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | 27000 T               | 10.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 11 m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | 1.565                 | 42.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1.410                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | No. of Concession, Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | -0.05.1               | In Complexity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | conductor T.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 0.01                |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 10.000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | 28                    | 19                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | - Mo 1 (01) +                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | 194                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1011                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Why hit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| and the second      |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1018                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 12 110                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| (inclusion)         |                       | The local data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 100.200                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1012-02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| THE COMPANY         | the state of state    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | and the second se |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Charles Parts       | - tesure              | The second second second second second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | and a second sec | the shear as                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ALCOLOGY PROPERTY AND A STREET                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                     | Conv. n               | 24.000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 0.0.000110                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | Building our          | STRAT, OCTOBER 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2, B-11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     |                       | A STREET AND ADD. I MAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Links means 11,712 man                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | and a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | and the second s |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | and the state of the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | sulf a sulfue.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Fail Lars           | ALC: NO               | Section 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | C. Announced                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | DIST AND ADDRESS (191                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| DESI, WILLT         |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Cont ( And Control of )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | Tolom 2               | 20-82 stapt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | -10 T.N.              | sillin de com-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | and the second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Report Annual Taxa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | JOYN A                | Contract March 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 254                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 10                  | 1.121.1               | An address of the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | more and being part                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | 218,5                 | of Gargy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | and the second s |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | 1755-0-1              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 152                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Stollin .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | - IIDAAAA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | initia di seconda     | P 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 125 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 15:15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | 0111                  | No. of A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 120 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1000 B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| ,000.0              |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     |                       | KIN (LL)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 111 220                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | 1010                  | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 111-201                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | T River               | Mindle and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 541.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | LATER OF A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

AC's TECH™

|                   | and 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 31.32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |                                                                                                                |            | be an             | 16.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------|------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   | and i                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 52.811                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                      |                                                                                                                |            | ben al            | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 10411010                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | since Children all a |                                                                                                                |            | Berlin III        | and and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | 100 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | a 1 a 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0400 012 1 Miles     |                                                                                                                |            | 211.61            | 10.10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | 07                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1 a. att.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                      |                                                                                                                |            | 617 March         | 1.001671                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | may million                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | - F24+101                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                      |                                                                                                                | 1 HOURT C  | LOCK:             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | 75.8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                |            | NE/C.             | 19.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                | invest ( ) | MOVE L            | -500 1.000 f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Summer of the     | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                | 100        | and the second    | and parts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Cit in the second | and a second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Contraction (Contraction)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                      |                                                                                                                | 25         | 10.5              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| University A      | sho date to                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | put strangers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 10.02-1              |                                                                                                                |            |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| and pus           | nies Mideus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1 n 1 n n 1 n 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | to - instated        |                                                                                                                | EnimotieA  | Calibra Itan      | 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| TENS WI           | th the file                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | AD 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                      |                                                                                                                | -Enter     | with pointer      | r to lowree                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | data w X2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                | 1 Partient | week menore a     | marian in 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1941                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                   | month in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Au. +4 - 1-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                      |                                                                                                                |            | and the line is   | and the set of the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | All and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                      |                                                                                                                |            |                   | ALC: 10-1, 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | 2010/251                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | TV: DD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                      |                                                                                                                |            | menore -          | divide rate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | (0.2., T (0.2.))                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 100/1002001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                      |                                                                                                                |            | TOYE !!           | D150_New                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | E()/(2210)) AV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                   | Automit 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 40 52                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |                                                                                                                |            |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | 188.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | # 6 Y J G                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                      |                                                                                                                | 7545 -     | INED bytes        | 2 SYCRA TR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | to hatdware BUIL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                   | have b                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | alterate.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                      |                                                                                                                |            | microse 1         | Alexandren                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                   | and the second second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 10.10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |                                                                                                                |            | Print Price State | 1111                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | and the standard st                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                   | 120231                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Pro de                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                      |                                                                                                                |            | EPOX.0 - +        | SADATTLY.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | 10.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 10000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |                                                                                                                |            | poveri            | (dl) 1491;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | and a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 45565068                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 00                   |                                                                                                                |            | dora              | 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | thiotom,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1801-,010                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 14                   |                                                                                                                |            | manny L           | 12.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Canvo such for . Batta byths at the very                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                   | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                | 1 . mill   |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | count from one of the reaction of the fact                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                | 100        |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                |            |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | and the second se                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| CONTRACTOR DIS    | 0.04                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                |            | BOWDE.            | #11. dl                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | manage of usedoots                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| LENGE W           | LD) pourter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | to avail d                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ALE OF AL - updi     | 17.0.00                                                                                                        |            | hoving            | #0 db                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | SWEENE COUNC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Erling W          | L' pointer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | to destinat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | in to be - no        | the second s |            |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                | dard on    | 100               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| and the           | - Common St.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | and the second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                      |                                                                                                                | De chora   | Property in       | and the second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Level a           | an encore an                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                |            | boye.t            | 12403403                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 64 - F65                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                |            | U01 C             | Cru Leice                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | Prooffil, J                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0. 38. I.V.B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1                    |                                                                                                                |            | #0.0g. 1.         | 84                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | 20,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 10.85                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |                                                                                                                |            | (COVER)           | 15411014                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | B2. Lable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Finnda            | AND DOTT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                |            |                   | 107.170000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 10. Au                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Constraints.      | Contraction of the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                |            | herse in          | 12414040                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | all have                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                   | brau                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ALC: NO. I.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                      |                                                                                                                |            | BOMOG             | 10.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | mover, w                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0.0120101                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1.0.3                |                                                                                                                |            | mayest            | 115K_044                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | heniTrinchyds di wilde                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                   | TLOVE 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 11/11/95/65                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0.68                 |                                                                                                                |            | inverto-          | de                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| inter a           | DOVE - T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Fuil ( = , 011                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                      |                                                                                                                |            | office 1          | 36.45                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | a feed of a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 11.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |                                                                                                                |            | The Mart of       | dia and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | 1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 11111                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |                                                                                                                |            | and a             | 5000 MB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | ALC: NOT THE OWNER OF THE OWNER OWNER OF THE OWNER OWNER OF THE OWNER OWNE OWNER OWNE OWNER | SAMPLE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                      |                                                                                                                |            | 181 1             | 10100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | 273.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 100, 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                                                                                                                |            | 02.1              | de, du                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                |            | 02.1              | 121. 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Receide           | - 117 A 17 A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                |            | - Lory            | -model of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | No Transform                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Letter and Let    | 2.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |                                                                                                                |            | All A             | 28 . 13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | out consider                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                   | 10.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Contraction of the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      |                                                                                                                |            | active (          | 1001109                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | POVIE M                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1.12.91-2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 5 (d)                |                                                                                                                |            | non'eq.           | 10,40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 12.0              | Income. 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | the territ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                      |                                                                                                                |            | PCVVQ             | 13, 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | DIT O                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Stroda                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                      |                                                                                                                |            | Invr              | Especialization                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | on PER minore volat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                   | Strick                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | HI. 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                      |                                                                                                                |            | Ours              | of all a second se | and the second second second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ACCULATION OF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                      |                                                                                                                |            |                   | 10.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | manufa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1012015515                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Sar.                 |                                                                                                                |            | Sector Sector     | (191) (201                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | All un Present                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                   | NUMBER OF STREET                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 12/u + (d) (d)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 10                   |                                                                                                                |            | E.m.t             | Emode Lo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | og hender tokskut                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                   | - CTR 8-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                |            | maive v           | -80.83                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | SAVE LEW MALE CONSIST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                |            | addit 1           | March 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Printers.         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                |            | Harr              | Enclude                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | consider Alex Alexa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| distant in        | and a manual                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | A A A MARKET A A A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | the said assess      |                                                                                                                |            | Logy              | articles and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | the literate on a prope                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| cours a           | ANT LINDOWNER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | a co cope ve                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 06 (b) (c)         | 100-3 (W. D.4.                                                                                                 |            | 20-15-11          | 125,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| The du            | dillor ac                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | uss mind                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                                                                                                                |            | End.              | 4114.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                |            | toma -            | Encodetax                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ng data byong character                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| (Links)           | aven they av                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | NE VE 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                                                                                                                |            | Law1              | LOTTOTL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                |            | miles I           | 12.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | and I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | day day.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                                                                                                                |            | and any 1         | 81. 270                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | monte                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                      |                                                                                                                |            | arried.           | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | 100008                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                      |                                                                                                                |            | makers in         | 1 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | Contract Street Street                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                      |                                                                                                                |            | tine = :          | 10C.1002                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | 2027                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 30.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |                                                                                                                |            |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | w110-1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 32.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |                                                                                                                |            | 2007 B. M.        | \$5m/mi /7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 101                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                   | and a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                      |                                                                                                                |            | have              | THE REPORT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | CRITIN WITH TO AVAID PARAMETER STO.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                   | harms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | A XM and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                                                                                                                |            |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | a source reason and an ansate reaction read                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                   | 4.000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                      |                                                                                                                | 1000       | and the second    | 10.10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | 100.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Contra Carlo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                      |                                                                                                                | 1109/23    | stile with        | LUGE DEFA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 30,00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |                                                                                                                |            | All (             | Sec Rega                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | Cit allo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | #12 - C+101                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                      |                                                                                                                |            | one h             | \$800,20159                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | THEP-metrinekves, 67, 91                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                   | ben. e -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                      |                                                                                                                |            | bea.e.i           | Marrada                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ing all                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                   | and a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 100.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |                                                                                                                |            | 2                 | Real A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Theorem and a statement of the second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 14 T F                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                      |                                                                                                                | 6.5        | Sector at         | \$2,000 P.V. 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | monump) trance historic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| -0.8              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                | MATTIC     | (meb)             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | TOY -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2,00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                      |                                                                                                                |            | - TV              | 1021001 N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | deconval 1 1945 OFF or nync'                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                   | SOV 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | C 10010                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                      |                                                                                                                |            | DOM: N            | 1559.95.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 540701411                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                   | 12.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                |            |                   | a series a prove                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SALASIAN USUER ANNOUS TA ATE MANA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                |            |                   | Course of the second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | and the second s |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | and from the local                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      | and the second second                                                                                          |            | These             | 00.5m_0m(                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| (10) 0            | 02149 - OO M                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | State in right                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | DON OF \$11 2010     | And while proble on 19                                                                                         | e          | tim r             | THE AV .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | spectronity delay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 1196 B11          | as the girt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | APPS 1.25 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                      |                                                                                                                |            |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                |            | (TENT)            | VESTIMAN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Contrast of       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                |            | The state         | Sug-Based                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Crart (mail       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                |            | 100.0             | ana                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | 0.04.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1961135                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                      |                                                                                                                |            | Didi L            | VEELCY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | 8,8,8,8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 80 IAU                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                      |                                                                                                                |            | ENOTE             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   | 1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | NUMBER OF STREET, STRE | 1                    |                                                                                                                |            |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                |            |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | A COLOR |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 11,2014       | I COA had been him I first meeting                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Did to contract to press                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1.000         | 17 C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1.0.0         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 10.00         | <ul> <li>Description</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| And and an and an a set of the se |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               | - I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| and the second s |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| second and second se                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               | the space of the second s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| and a second sec | (14)4   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1000    | And an owner of the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |               | state water a state of state of the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| and the second se                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1.4.0   | and the second se |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| and the second s |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               | the local                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         | · · · · ·                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| and the second sec                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 11.00         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 100           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| and the second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 10.00         | and the second second second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 100 ON Media (000)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | - Channel     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               | and a second second second second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 10.00         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| A4.5 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | -15-1         | A REAL PROPERTY AND A REAL PROPERTY.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Annual Annual Annual                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| The second se                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         | A.111                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| -1-1-1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| provide and the second se                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 1.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| the second se                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1000          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| and the second se                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               | and the second second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 100 million (1990)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               | second second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| and a second sec | (       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| owgen der                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |         | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |               | contrast Alternative and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| and the second s |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1 1 1 1 1 1 1 | and the second s |
| the second state and the second second second second second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | tare 1  | 1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 10.00         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| the same linear and a solution where                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         | 1.0.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         | The C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 10.00         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| and the second se                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |         | And and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| and the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |         | A 100 K                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 11.1 ··································                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2 INC.  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | NO.           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1.000         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 11-W          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| The second se                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| ten an                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| A10-A H A10 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1.000   | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               | - III OA-E ORI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| AND DEPENDENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1.1.0   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               | Comment of the state of the state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| (100) (100)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               | (T) - 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| the second se                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         | and the second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |               | and a second sec |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | - X-          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| many and the second second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               | 141                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         | 100 B (1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| and a second sec |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| And a second sec | -1 3    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 111-1-1       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 10.1          | and an inter-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

AC's TECH

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 842-8         | 0.5, (#                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | moved-        | 43,037                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| SeekLoop                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | dent.         | m. in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | \$400.m       | Nobrive                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | arts.         | distant.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | (industri)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | law.          | The local                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | and to fact to chart there there a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Line L        | No. of The Party o | And the set of the set |
| the statement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | DINALD.       | ec.a.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Andersdavide and track conducts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| the state of the s |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 100           | ALC: NO.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ALC: CONTRACTOR OF A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | En EL         | ALCEARDER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | states - states rates rate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Dec.a         | FUG21 about                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ND-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | indeid-2      | 41/64                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | DEAT          | 40.1541                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | BCL!          | #05.5AR7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 157 EF Fried                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 20113         | #UL-1245                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 201           | -debayk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | bra.          | 151 mpLoop                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| EndStepla                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | adp r         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | wild 1        | 62. 62                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | POYERS        | 62 (49)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Dilet         | 35.1385                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | (deldied)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Notitive:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Kidy.         | 45.06                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | adda. I       | RI, al                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | digg b        | 47.62                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Inter in      | Grack Laboration                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ate 1         | 1401                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | in a          | delarin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Der l         | Louis dive                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | NUMBER OF STREET                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | PROFILE S     | 1950.41990.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | en en en esta                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | A Part        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | A COMP.       | Control manual                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Section.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | artes         | A PRIVACION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Official Policy of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | a second      | ALC: NO. OF TAXABLE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1. Sec. 1. Sec |
| (19540) 14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | We hill which | (). (A ()) () () () ()                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | the state of the second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Huchton (                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | lation cope.  | TO THE TE C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | duck to an Anent                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               | ALC: NO.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | never:        | 010/du-129/1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2 Outpu                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | move.1        | USR_Pants                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | difer(hi) wi                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | HOVES.        | 112.41                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 17 31 1023 FL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | sove i        | \$55555555                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | AP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Witchnop:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Ellip .       | S-BASYTS"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2000          | 1 ski                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | bire is       | V=scs c                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | the second se                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.100         | Checklum                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | stdry younkelse header checkeur                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | move 1        | 1 65. dit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 10/02-        | Denodet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Infrences coecharan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 10000         | 30,34                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | buie h        | Weitrebe                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Seader er/CI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | bevi          | Georgelithei                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Lideta with thereine                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | DOVE.         | -50.000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | THE STOCE STOCE IN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | manual and    | EIDZ618.H                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Barry In      | - hack war                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ad assessed dut an electric                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | vent 1        | 12. 116                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1.0.200 States and a State of States                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Hind In       | Verveuer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Alta witter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Allera        | d' - waster                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| (Trail)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Sector Sector |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| B-100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | in the second | Los Louis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 100.000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 41.5          | South a Constant                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| VarTheres                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 92.0          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| -verrieur                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | -             | Entry, mar                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Automatical States of Stat |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | BULLET A      | ford and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | (rAttanrid)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | DS-2 VIII     | 250                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | PTOUL P       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Sector of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | and an a      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Chocksume                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0.00          | ALC: 32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | paying        | \$10, do.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| CTRECK LUNK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ordel -       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | internal and an and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 104 - Dime                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | set of rea    | pacture on th                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Cc. F.342                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| NZ DUE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | NEAT ED SH    | e gars abo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ates                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 107 - 195                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 555596        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| (DX) Wit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | D checksum    | 10 25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | molyee.1      | GP 01, 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | p*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | molverg       | X0.45                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | mover-1       | 14211141                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | W25.1         | 64,65                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | EUDG-W        | 81/00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Inc.z.        | 1.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

|          | and do 1              | 20.1 - 021            |
|----------|-----------------------|-----------------------|
|          | Automatical and       | 1 1 - 20 11           |
|          | 16.00                 |                       |
|          |                       |                       |
| CepyMen  |                       |                       |
|          |                       |                       |
| AL INS   | 220                   |                       |
| al the   | Print sono            |                       |
| 20 . 111 | -                     |                       |
|          |                       |                       |
|          | movies 1              | CONTRACT, 1981        |
|          | Bull PO               | alization             |
|          | COD. 1                | 131-00                |
|          | Delui I               | 1.0                   |
|          | and on the            | 85×81                 |
|          | 8 (R. 1)              | TOTAL STREET          |
|          | big a                 |                       |
|          | market                | a serie a serie and a |
|          | 1.003                 | 11.00                 |
| 111      | Parine 1              |                       |
|          | LAW.                  | #Usena                |
|          | dermont.              | 14                    |
|          | sib/w.l.              | 100x al               |
|          | 10.55 (4)             | (B), 9T               |
|          | Annual Sal            | (0.1 are 1.00 a       |
|          | nake7                 | ALC: YOU A            |
|          | 1.022                 | àl i a'               |
|          | D/Sul                 | - Audi                |
|          | bovm."                | 01 07 L 10 1051       |
| 12       | moyam, T              | subbe, de T a se      |
|          | 1000                  | Stational at          |
|          | 10,700                | 112100.04             |
|          | ×53 1                 | 9611                  |
|          |                       | effit, edit.          |
|          | CTD                   | 31.4                  |
|          | and a second          | 12                    |
|          | potomi y              | 180-170-20-20         |
| 60,5     | 1.131 1               | 12.40                 |
|          | DOM: N                | 72                    |
|          | 1-4 i                 | 4.5 (2)               |
|          | 2001-2                | 1.0                   |
|          | 1.000                 |                       |
| 141      | 20000                 | 1000 +, 1000 +        |
|          | dered.                |                       |
|          | 1000                  | 101111                |
| 0.11     | 1000                  | 12011000              |
|          | 100.2                 | 1.0                   |
|          | 00140                 |                       |
| 145      | man in an             | 1                     |
| 744      | and a second          |                       |
|          | Dist.                 |                       |
| 1211     | and the second second | TATES AND INCOME.     |
| Lin      | Una                   | - Index of            |
| -        | 001.4                 | 30.00                 |
| 171      | and so its a          | Labor 20 Second       |
|          | 12.6.0                |                       |
|          |                       |                       |
| Constant | adforii) m            |                       |
|          |                       |                       |

(2) If provide an equilibrium of the first of the spectrum of part of parts of the spectrum 
|         | particular in the | ALC: YEST FLOOR - 1            |  |
|---------|-------------------|--------------------------------|--|
|         | 00000             | AL 4. OFFICE TRADUCT OF TRADES |  |
|         | moved.            | et.dl any communers            |  |
|         | 10.000            | pin intellecture               |  |
|         | 3.85              | Stationautorion (*2            |  |
| Terral. | 10/08 - 0         | an order                       |  |
|         | ACUT<br>BBS       | MALANE ALTERNATION             |  |
|         | 200               | 1                              |  |
|         |                   |                                |  |

| 1000         | 1.985.1          | 45.85                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | 1252             | 41.01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|              | obra             | SL CHEAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|              | 194220-1         | reperiod do normale en                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|              | 10.0             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|              | -                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|              | (30)             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| -            |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Listi        | na Two           | disktest s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 1 Acres 1    |                  | Unatticotta                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|              |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| (Globent)    | - 100 b s        | program for distance, tax level distances                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Diministry ( | AUM CALLS        | 1 - (W) = -1 - (W_132, 3017                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|              |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|              | exerch           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|              | 2011126          | CITE GUT HOLE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|              | 100              | 6.42                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|              |                  | 1.41                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Militale     | Aller TOOP       | 150 Int our stack publics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|              | DCI16G           | FROM_CRIPIdI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|              |                  | #\$1595_5.00000055.00.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|              | 285              | A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|              | 1010 -           | 10. Terebally a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|              | 2655             | Marris (                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|              | Section          | ALC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|              | any and          | to set it was                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|              | 201              | A Low Mary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|              | million.         | OD COLLEGE LEET                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|              | Lief;            | Aburel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|              |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|              | 18.0             | disknine(pr), al.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|              | 9V2              | opensional and the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|              | 2004-1           | do, pollocia cepti-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|              | 100              | Trans , - 1 as                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|              | and and a second | and the state of t |
|              | - entre          | the following the state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| (Internet    | te the local     | Vibit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|              |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|              | LiB_1            | 14/0 L                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|              | 518              | F LOUTAND                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|              | polys 1          | 20 HF_STG(ASTINI)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|              | 40145            | 1- [, d]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|              | EV:              | 1102500010                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|              | Coldina (1)      | AND MY STRATED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|              | 1.64             | ME MORE STORY OF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|              | NEWDORT          | W                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|              |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| an mitte     |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|              | margin i         | 12-01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|              | 10.50            | Terromcebel (bril) ne                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|              | Sec.             | DA_SETVICTION 61                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|              | Lans I           | and the second second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|              | CONTROL OF       | - Leifertone-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|              | Sec. 1           | 4.76                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|              | 315              | A.L2011                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|              | Cta D            | Setting                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| SKILGEL/F    | hh.              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|              |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| O.N. 60 75   | A LEASE CON      | Dyve curves over the grint                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|              | 100              | Anthene stars are been source and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|              | 1001             | conversion that the party on these sets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 1580, 15 Dr  | thei board       | will for RVPS code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|              |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|              | Cont.            | OLSE Jatakeen (pc) al                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|              | TOYE :           | CAMBRIDER (DE) . D.S.F. Rawfort Der (AL)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|              | TOPT             | Convedbation (2010) incon (2010) and a convedbation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|              | Acres Ser.       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 1            | Test orda        | BUARD RAIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|              |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

#### Copy a disk learn deave 0 to drave t

(WARRING: Amount one of the disks after the copy of Anightes will (church) (due to both disks baying the news exect name and treation free)

|                 | mare 1           | (E.) 27X      | 102.0100     |                                          |
|-----------------|------------------|---------------|--------------|------------------------------------------|
|                 | DOARD            | #197GF        |              |                                          |
| - CopyLoop      | ç                |               |              |                                          |
|                 | grove I          | 9512*20,4     | ill clength  |                                          |
|                 | moom./T          | #0.42         | Tqs7A6.      |                                          |
|                 | move_1           | Why Roller    |              | /Dulini                                  |
|                 | a las            | 0.641         |              |                                          |
|                 | Diffe            | Error         |              |                                          |
|                 |                  |               |              |                                          |
|                 | 0076-1           | 8512*22.0     | ti "Nength   |                                          |
|                 | polye i l        | 11.42         | 12/12/20     | a la |
|                 | NOVE S           | aw/eoties     | 2.48         | panter                                   |
|                 | ran. h           | WALS          |              |                                          |
|                 | bite             | Berge         |              |                                          |
|                 | 6.66.1           | 105124724     | 10.00        |                                          |
|                 | dina             | di, Capyl     | oop          |                                          |
| LET DE L        |                  |               |              |                                          |
| -               |                  | cole anda -   |              |                                          |
|                 | 1441             | From Aures    |              |                                          |
|                 | Der              | Restorese     | ad Posicimo  | idelye subdivenut for scircerus.         |
|                 | hove.1           | remourcep     | dripel, ab   |                                          |
|                 | (0.5             | IN GIVEN      | 21(46)       |                                          |
|                 | eova i           | 6.45          |              |                                          |
| Normal -        | ssē.             |               |              |                                          |
|                 | Les .            | HED OTHER     | Test at      |                                          |
|                 | 20V/00           | 36.65         | (hor) faire  |                                          |
|                 | hove .p          | HP STORTT     | 1051.00      |                                          |
|                 | SVE              | TLUSIank      | 1            |                                          |
|                 | 2010             | in the second |              |                                          |
|                 | SCAL 1           | A111-5121     | 100          |                                          |
|                 | 595              | Transfer      | her (bel' at |                                          |
|                 |                  | Course .      |              |                                          |
| ABREEZ!         |                  |               |              |                                          |
|                 | 1000             | FDZ SK_RAW    | But Siten do |                                          |
|                 | 1.000            | THEOUTOF A    | (pet.Al      |                                          |
|                 | Sec.             | ( a substan   |              |                                          |
| Apertis         |                  |               |              |                                          |
|                 | roweg            | ₹ũ,dũ         |              |                                          |
| Correspondences |                  |               |              |                                          |
|                 | *********        | ********      |              | ****************                         |
|                 |                  |               |              | ***************                          |
| alskoarel.      | dc.b             | 50. 8 Test    | oorse' (\$   |                                          |
| TTINUT DIE      | 1.1              | de.J          | 0            |                                          |
| (WP) (CL)       | de l             | 0             |              |                                          |
| cookednoty      | (Cg))            | de.1          | 0            |                                          |
| WWINLES         |                  | 3,958         | MUSIZE ?     |                                          |
| replypert       | detr.is<br>entro | MP_SINE/0     |              |                                          |
|                 | include          | *daux, d*     |              |                                          |
|                 | DECLINA          | motorier.a    | iel.         |                                          |
| NULLEY:         | di ti            | 512+21        |              |                                          |
|                 | end              |               |              |                                          |
|                 |                  |               |              |                                          |

| Figure Two                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Protocol Editor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |        |                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----------------------------------------|
| HUSTS-IN FILM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | and the second to be second to |        | IDIT PROTOCOL JOB                       |
| Provensi Provinci Pro | num annaria tinala<br>terana<br>terana                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | the Ne | Name Office() 00000<br>Name Langth ( 00 |
| ince we                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | (K. 1999999), ent?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |        |                                         |
| 1010                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | (X.11).17                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |        |                                         |
| LITEINGS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |        |                                         |

The important part of this protocol is found in the Data strings in the SEND and RECEIVE panels. Briefly, the RECEIVE Data entry says to read data in 16-megabyte (\$1000000-byte) chunksuntil an SF7 is received. The SEND Data entry says to send 16-megabyte chunks of data until there is none left, and then send SF7. (Note: SF7 is a special MIDI byte meaning "end of system exclusive data.")

In other words, this protocol is rather mindless. It grabs or sends as much data as it can find, regardless of what the data looks like. If you could hand it a DebuxePaint file, for example, this protocol would happily send it to your MIDE synthesizer. (No, the picture would not appear on your synth's front panel!)

#### What Does a Smart Protocol Need to Know?

To make your protocol smarter, you need to tell it some vital information, such as:

- . How long (in bytes) is the data for 1 patch?
- . How do I ask for a patch?
- . How do I recognize the beginning of a legal patch?
- . Which byte represents the patch number?
- . Where is the patch name located, and how long is it?
- . When I am sent a patch, do I need to respond?
- When I send a patch, should I expect an acknowledgement?
- If the user aborts a transfer, should I inform the instrument?

You do not need to answer all of the questions: only those that apply to your instrument. For example, some instruments transmit all their data in one big message, but others require an elaborate "conversation" between the sender and the recipient. You must read your instrument's system-exclusive documentation to determine which questions need to be answered. For some help with this, see Phil Saunders "Medley" columns in the April and May 1991 issues of Amazing Computing.

#### Building a Protocol: One Approach

After writing several protocols, I discovered that there is a pattern to the process. Here's a brief outline.

- Obtain a copy of your instrument's system exclusive documentation. Specifically, you'll need to know the proper bytes to send when requesting a patch from the instrument, and the format of a patch dump itself. If this information is not included in the moner's manual, then contact the manufacturer. Many manufacturers will send you the information free of charge.
- Use Generic Single to receive a patch from your instrument. You will need to initiate the patch transfer yourself by pressing the appropriate battons on your instrument.
- If the manufacturer's documentation does not tell you the size of a patch dump, then look at a patch's data using the Librarian's Edit Entry command, and determine the size yourself. You may also wish to examine the patch dump in more detail.
- Starting with a copy of Generic Single, write the RECEIVE part of the protocol. Test it.
- 5. Write the SEND part of the protocol.
- Make Music-X extract and display the names of patches as the are received, if applicable.

The rest of this article will concentrate on items (4) (brough (6). Before we can construct the SEND and RECEIVE parts of the protocol, however, we must learn about Music-X variables. There are three kinds: numeric, data, and string

#### Numeric Variables

A numeric variable is much like one tound in programming languages or high-school algebra. It is a single letter (case-insensitive) that stands for a numeric value. Some of these variables may have their values set by you on the Librarian Page

- P The patch number that you set on the Libranan Page.
- N The MIDI channel that you set on the Librarian Page and others have their values maintained by Music-X:
- M Total blocks sent
- V The last value received.
- K Checksum of a specified sequence of bytes.

A complete list of numeric variables is found in the manual.

#### Data Variables

The two data variables, X and Y store sequences of data sent or received by the Librarian. X stores data in its raw, unmodified form. Y stores data in "nibblized" form, discussed later. The manual discusses the formal syntax, but here are a few examples to get us warmed up.

In general, to store k bytes of data, you use the expression:

(X.k)

For example, this is how you tell Music-X to send or receive 25 (\$19) bytes of data:

(X.19)

## Writing Protocols in Music-X by Daniel J. Barrett

Congratulations! After working hard all summer playing keyboards with your band, you finally have saved up enough money to buy that fancy WhizzySynth 3000 sitting in the music store. You bring it home and happily start making your own patches. At the end of the day, you decide to store those patches on an Amiga disk using your trusty Music-X Librarian. But after looking through your "Protocols" directory, you find that the Music-X Librarian doesn't support the WhizzySynth 3000 for patch transfers! Oh no... what can you do now?

Well, it's time to write your own protocol Music-X's Librarian is billed as "universal"; it can communicate with any MIDI instrument, provided that you supply the right information using the built-in Protocol Editor. Although this process is documented in the Music-X manual, it is still tricky to do. In addition, the manual is more of a reference than a tutorial

This article will teach you how to write a Music-X protocol and contains plenty of examples 1 won't repeat straightforward information found in the manual, so I recommend having it near you while you work through this article. Also, I won't cover every single detail about protocols; instead, FII concentrate on the more practical uses (and a few less common ones) so you can start writing protocols as quickly as possible.

Since this is a technical journal, I'll assume that you know how to use an ASCII table and hexadecimal numbers. In the text, all hex numbers will be preceded by a dollar sign to distinguish them from decimal numbers. (For example, hex 542 equals 66 in base ten.) In addition, some familiarity with MIDI system exclusive data will be helpful.

#### What is a Protocol?

First of all, what is a protocol? It is a general description of what your instrument's patch data looks like. (When I say "instrument" here, I really mean any MIDI device that is capable of sending and receiving system exclusive data.) Equipped with this information, Music-X can send and receive your patch data. If the incoming MIDI bytes don't match the given description, then Music-X will inform you that an error has occurred.

Both libraries and protocols may be saved as separate files on your disk. The following diagram illustrates the relationship of library and protocol files (see figure one).

#### Figure One Relationship of library & protocol files.



Although library files are physically separate from protocol files, every library file has a COPY of some protocol inside it. If you modify the copy inside a library, and then save the library, the protocol file on disk is not affected. Similarly, modifying the protocol file on disk does not affect any libraries. Thus, if you have a protocol that is used by ten different libraries, and you want to modify that protocol, you must change it in all 10 libraries! This is a shortcoming of the implementation.

Music-X comes supplied with protocols for several popular instruments. In ps.-ticular, there is a "generic" protocol called Generic Single that works for almost all instruments. "Well," you say, "if this generic protocol is so versatile, why not use it for all my instruments?" One reason is that Generic Single cannot request patches from your instrument—you must initiate the transfer from the instrument's front panel (assuming this is possible). A second reason is that it cannot distinguish legal from illegal data. This means that if there is a transmission error between your instrument and your Amiga, the generic protocol will not notice.

However, Generic Single is a good starting point for writing your own specific protocol. Let's take a look at the generic protocol by making a generic library. Run Music-X, and choose Librarian from the Mode menu. Then choose New... from the File menu, move to the appropriate directory, and select the file Generic Single. Finally, choose Modify Protocol from the Edit menu, and we have arrived at the Protocol Editor (see figure two). Here is how you tell Music-X to SKIP past 25 bytes of data, not storing it:

#### (X.19.19)

Here is how to tell Music-X to break 50 bytes of data into nybbles, delete all the most-significant nybbles, and concatenate the remaining data into 25 (519) bytes:

#### (Y.19)

#### String Variables

String variables can hold any text. The most commonly used string variable is Prefix, whose value is notated as PR in your data. Typically, system exclusive messages for the same instrument will begin with the same few bytes. To save typing (and make modification easier later), store those bytes inside the PR variable. Our later examples will all do this.

A second, very useful string variable is the Program string, which is represented as PG. To use it, fill in the strings labeled Normal Program and Preview Program with anything you like. The value of the PG variable will be either of these two strings. You toggle between the two values by pressing the PREVIEW button on the Librarian Page. This provides a convenient way for the user to change the behavior of the protocol without entering the Protocol Editor.

Two general-purpose string variables are known merely as #1 and #2. Fill them with any data you like, and use them anywhere on the SEND and RECEIVE panels. If you don't actually need these strings for protocol data, they provide a convenient place to write comments to yourself about the protocol.

#### Writing the Send and Receive Strings

Filling in the SEND and RECEIVE panels is perhaps the most difficult part of protocol writing. You must describe a MIDI "conversation" that allows your instrument and Music-X to communicate. Music-X breaks down the communication into five types of messages. Initiate, Confirm, Ack, Data, and Cancel. Some instruments use only a subset of these messages, but others require an ongoing conversation (known as "handshaking") while data is being transferred (see figure three).

An Initiate string says, "Hello, I would like to begin a patch transfer." To determine its value, consult your instrument's system exclusive documentation, and look for a message called



"Request to send," "Request for bulk dump," or something similar. For the SEND Initiate string, one often uses the header from a patch dump.

If your instrument does not require any handshaking, then you will need to use only the Initiate and Data strings, and you are now ready to write your Data strings. These contain the X and/ or Y data variables for sending or receiving the patch data and storing it as a library entry. The case studies in the next section will provide several examples.

If you instrument does require handshaking, then you must also provide Confirm and/or Ack ("Acknowledge") strings. These strings each represent the message "I am ready!" Confirm is sent by the instrument (and so Music-X must be told how to recognize it), and Ack is sent by Music-X. Depending on the system exclusive implementation, your instrument expects a particular sequence of Confirm/Data/Ack messages. The Music-X manual is really quite good about explaining this mechanism; however, you will need to spend some time with your instrument's system exclusive documentation to figure out what messages need to be used.

Finally, if your instrument requires a special message if the patch transfer is aborted, you should fill a value for the Cancel string.

#### CASE STUDY: Sequential Circuits Prophet T8 synthesizer

Sequential Circuits was the company that essentially invented MIDI. The T8 has a very simple MIDI implementation, and the patches have no names, so the protocol itself is quite short.

Reading the T8 manual, we find that the following message will ask the T8 to send a particular patch via MIDI.

| SFO  | "Begin system exclusive" byte.        |
|------|---------------------------------------|
| \$01 | Sequential Circuits' manufacturer ID. |
| 500  | Request to send a patch, please.      |
| -    | The patch number.                     |
| SF7  | "End of system exclusive" byte        |

Music-X needs to send this message when it wants to receive a patch. So, we fill in the following data in the RECEIVE Initiate box:

#### F0. 01. 00. P. F7

Now, Music-X must be prepared to receive data from the T8. A patch contains 68 (544) bytes of data, followed by SF7 So, in the RECEIVE Data box, we write:

#### (X.44), F7

Now, we could have written (X.45) and grabbed the SF7 byte at the same time. However, by writing SF7 explicitly, we cause Music-X to check that an SF7 is received as the 69th byte. Also, since we have specified the SF7 separately, not as part of an "X" variable, it will not be stored as part of the patch. We must remember to append an SF7 when we send our patch data back to the T8.

To fill in the SEND panel, we must examine the T8 patch data dump format: SFO "Begin system exclusive" byte.

- Sequential Circuits' manufacturer ID. \$01
- \$03 This is data for one patch.
- The patch number.
- 68 bytes of patch data.
- SF7 "End of system exclusive" byte.

To transmit the patch back to the instrument, we could simply send everything we have stored. However, this is a bad solution because the original patch number is stored inside the patch data. Thus, we would be able to send the patch back to its original location ONLY? This is not very versatile, especially since the Librarian will let us change the patch number on the Librarian Page if we use the "P" variable

To solve this problem, we'll use the first part of the data dump format as our SEND Initiate string, skip the original first four bytes of the stored patch, and then send the rest of the data. So our SEND Initiate value is now:

F0.01,03, F

and our SEND Data value, which skips past the first 4 bytes, is:

(X.4.4), (X.40), F7

Note that we remembered to append the SF7 that earlier we chose not to store.

Since the first two bytes of both Initiate values are the same-SF0, S01-let's define the PR ("Prefix") string variable to have this value, and use PR in both Initiate commands. They become:

RECEIVE Initiate: PR, 00, P. F7

SEND Iniliate: PR. 03. P

and our TS protocol is now complete (see figure four).

#### CASE STUDY: Oberheim Xpander synthesizer

The Xpander's protocol is a bit more complicated than the T8's because Xpander patches contain names that we can extract and display on the Librarian Page. To build this protocol, we consult the "Oberheim Xpander / Matrix-12 MIDI Specification," part number 950038 from Oberheim.



Using Generic Single to grab 1 patch, and reading the documentation, we find out the following information:

A single patch dump contains 398 bytes plus \$F7.

- The patch name is found in bytes 382-398.
- The format for requesting I single patch is:
  - \$F0 "Begin system exclusive" byte.
  - \$10 Oberheim's manufacturer ID.
  - \$02 This is an Xoander.
  - \$00 Send me a single patch, please
  - The patch number (0-99). SF7
  - "End of system exclusive" byte

The format of a single patch dump is:

- SFO "Begin system exclusive" byte.
- \$10 Oberheim's manufacturer ID.
- \$02 This is an Xpander.
- \$01 Here comes a patch.
- \$00 It is a single patch.
  - The patch number (0-99)
- 392 bytes of patch data.
- SF7 "End of system exclusive" byte.

Now we are ready to start writing the protocol. Since both the SEND and RECEIVE command will begin with the same bytes, we define the PR ("Prefix") variable once again-this time to be:

F0, 10, 02

On the RECEIVE panel, we set the Initiate value to:

PR. 0. 0. P. F7.

We now expect an entire patch dump of 398 (\$18E) bytes to follow, ending with an \$F7, so we can set the RECEIVE Data value tou

#### (X.18E), F7

For sending data, we use the same trick as in the T8 case study skip over the first several bytes (containing the old patch number) and substitute our own in the SEND Initiate value. This value is:

#### PR, 1, 0, P

We now skip the first 6 bytes of data (the header) and send only the 392 (5188) bytes of patch data itself, plus the SF7 we stripped off during the RECEIVE.

(X.6.6), (X.188), F7

Finally, let's tell the protocol how to locate the patch name. It is found in bytes 382-398 of the patch data. Thus, give Name Offset a value of 382 and Name Length a value of 16. The Librarian will now extract and display the name of each patch as it is received (see figure five).

| Figure Five                                        | Xpander                                                       |                                                                       |
|----------------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------------------|
| RISIC-R FATE                                       | : Apundini: - Yin Isais                                       | IDIT WWW FICH, INN (CO)                                               |
| Areiten<br>Minnal 7<br>Preterior 7<br>Tatch 5 dire | ( Russ   Xbander - Visione<br>namerini<br>Familie<br>Rame -   | Nume Office) (80302)<br>Nume Love(76) (5)<br>Over som 100(28,10)(17)  |
| marine.                                            | FN. 0. 0. F. F7                                               |                                                                       |
| 30                                                 | 0.1007. F7<br>F8. 1. 9. F<br>OL5.07. OL1007. F7               | }                                                                     |
| 100<br>100 (m2                                     | F8, 18, 12,<br>ComENIS: The Ocar Mas<br>He set Name Longth to | turns ASCII d's into psion chars,<br>13 Inst (6) to annid the last P. |

Normally, we would be done now. However, Xpander patch names are stored in a particular manner that requires us to do a little more work. At the moment, only the first character of the patch name will actually be displayed on the Librarian Page. We shall solve this problem in Example #2 under HANDLING PATCH NAMES, below.

#### CASE STUDY: Yamaha SPX-90

#### (or SPX-9011) digital effects unit

Un order to transmit patch data from an SPX-90, you must first turn its MIDI THRU jack into a MIDI OUT. This is done by removing the top cover (8 screws in all) and flipping switch monber SW105 to the "T" position.)

In this protocol, we will use checksoms and see an alternate, more reliable, method for handling the Data strings.

To request a patch from the SPX-90, the command is:

| \$F0   | "Begin system exclusive" byte            |
|--------|------------------------------------------|
| \$43   | Yamaha's manufacturer ID.                |
| 52n    | Use MIDI channel n, increased by \$20    |
| \$7E   | Send me some kind of patch dump.         |
| "LM 83 | 32" I am an SPX-90 (Ihere are 2 spaces). |
| "M"    | Give me one patch dump.                  |
|        | The patch number:                        |
| -      | had not at a start with the base of the  |

\$F7 "End of system exclusive" byte.

By now, we are experts and can convert this into a RECEIVE Initiate string quickly, except for the line that says "Use MIDI channel n." Music-X provides the N variable which always contains the number of the MIDI channel that we set on the Librarian Page. Once we add \$20 to it, we're ready to type in the string;

F0. 43. (20+n), 7E, "LM 8332", "M", P, F7

We will need some of these bytes again later, so let's store the first two bytes as the Prefix, and the two strings as Substring. #1. This makes our RECEIVE Initiate value:

PR. (20+n), 7E, #1, P, F7

The format of the SPX-90 patch dump is the most complicated we've seen so far:

| SFO    | "Begin system axclusive" byte                |
|--------|----------------------------------------------|
| \$43   | Yamaha's manufacturer ID                     |
| n      | Use MIDI channel n                           |
| \$7E   | This is some kind of patch dump.             |
| \$00   | Together with the next byte.                 |
| \$58   | this is the data length: 88 bytes.           |
| "LM 83 | 32" I am an SPX-90 (there are 2 spaces).     |
|        | The patch number.                            |
| -01    | 32 bytes holding the 16-character patch name |
| 1.4    | 46 bytes of patch data                       |
| -      | Checksum                                     |
| SF7    | "End of system exclusive" byte.              |

Our RECEIVE Data string needs to read 16 (\$10) bytes of header, 32 (\$20) bytes of patch name, 46 (\$2E) bytes of patch data, and 1 checksum byte. Using the same method as the previous two protocols, and ignoring the checksum issues for now, we would have a RECEIVE Data value of:

(X.10), (X.20), (X.2F), F7

or more simply:

(X.5F). F7

However, this time we will build more intelligence into the RECEIVE Data string by describing the format of the patch dump. This approach has two advantages: it checks the incoming data more closely, and it saves space by not storing the header bytes inside each patch. A small disadvantage is that the patch library data is now more heavily dependent on the protocol: thus, if you plan to write your own programs to interpret Music-X library files, you may have a tongher time doing it.

There are 32+46+1 (S4F) bytes of data after the patch number. Once again ignoring the checksum, we write the RECEIVE Data string as follows:

F0. 43. N. 7E. 0, 58, "LM 8332", "M", P. (X-4F), F7

This is now an accurate description of the data we shall expect, so Music-X will complain if it reads any non-matching bytes. Using our PR and #1 substrings, this becomes:

PR. N, 7E, 0, 58, #1, P, (X.4F), F7

Since everything before the (X.4E) is not captured by the X data variable, the header will not be stored inside each library entry. This fact is the reason for the advantages and disadvantages I listed earlier.

Now, let's handle the checksim byte. Yamaha forms its checksim value by adding all the bytes between #1 and (X.4E) inclusive, negating the value, applying a logical "and" operation with \$7F, and truncating to one byte. This operation is notated as (-K&7F.1). If the checksim received does not match this value, Music-X complains.

To form this checksum, we surround the relevant bytes with curly braces. Thus, our finished RECEIVE Data string is:

#### PR. N. 7E. D. 58. (#1, P. (X.4E)), (-K&7F.1), F7

Now it's time to build the SEND portion of the protocol. We must remember that the header bytes and the checksum have not been stored in the library entry, so we must construct and send them manually. Well, guess what? We can use the same patch description we made for the RECEIVE Data string. There is no need for any SEND Initiate string in this case.

To save typing, we store the RECEIVE Data string as string #2, and then just put #2 in our RECEIVE Data and SEND Data strings. We are now done except for handling the patch name, which we discuss in Example #3 of HANDLING PATCH NAMES, below (see figure six).

#### Handling Patch Names

If your instrument's patch data contains the name of the patch. Music-X can usually extract the name and display it on the Librarian Page the instant that the patch is received. In order for this to work, you may need to specify some extra information.

- 1. WHERE the patch name is located in the patch dump:
- 2. HOW LONG the patch name is:
- 3. In WHAT FORM the patch name is encoded: the "Character Map."

The first two items are pretty intuitive after all, Music-X needs to know where the patch name begins and ends. This information is placed into the Name Offset and Name Length gadgets as explained in the manual. (Note: these two numbers must be in decimal, even though every other number in the Protocol Editor is in hexadecimal.) The Character Map, however, can be harder to understand, so I will now explain it in detail and include several examples.

Even though Music-X knows WHERE your patch name is, it may not know how to INTERPRET it. If your MIDI instrument uses ASCII and stores its patch name one character per byte, then no special interpretation will be necessary. However, suppose your instrument uses the values 1 through 26 to represent the letters 'A' through 'Z', values 27 through 36 to represent the digits '0' through '9', and 37 to to be a question mark character. This is NOT the ASCII code. So, you need to tell Music-X how to TRANSLATE between your MIDI instrument's internal code for the patch name, and the standard ASCII code that Music-X (and most computers) use. This is done with a Character Map.

To construct a Character Map, picture the numbers 0 through 127 all lined up in a row. These are the numbers that your instrument uses for characters in patch names. Beneath each number, write the character that the number SHOULD represent to Music-X. The resulting two-row table is a Character Map. Here's the Map for our example above:

Now that we have the table, how do we fill in the Char Map field on the Protocol Editor screen? This field contains a list of RANGES OF CHARACTERS, separated by commas. For example, AZ means "all characters from 'A' to 'Z,' inclusive," and 06 means "all characters from '0' to '6," inclusive." You may also indicate a range of numeric values by using two hexadecimal numbers preceded by backslashes.

Now look at your two-row table and pack your second row into ranges, as described above. In our example given, you wind up with this Character Map:

#### \00\00.AZ,09,??

The first range, \00\00, is only one character long. It says that the value 0 should be translated into 0. Is this detail necessary? Yes, because a Character Map is always assumed to begin at zero. If we used the Map

AZ.09.77

instead, then the value 0 would be translated into ' $\Lambda$ ,' 1 into 'B.' etc. This is wrong —it's off by 1.

The second range, AZ, says that the values 1-26 get translated into the characters 'A' to 'Z.' The third range, 09, translates the values 27-36 into the characters '0' through '9. The last range, ?7, is only one character long, and translates the value 37 into a question mark character. What happens to the values 38-127? The manual does not say, so I play it safe and specify that they translate to themselves:

#### 100100, AZ, 09, 77, 12617F

Character Maps are versatile but have a few serious limitations. First of all, they cannot handle characters that are not stored one per byte. For example, the Prophet VS synthesizer stores its name in tightly packed. 5-bit characters, which Music-X cannot translate. Second, Character Maps are insufficient if your instrument's internal character set is wildly unlike ASCII. For instance, if a synth has an internal character set like this:

> 0 1 2 3 4 5 6 7 0... A OFTER BURNER

with characters placed arbitrarily in the table, there is no Character Map that can represent this translation.

But, you cry, why can't we define a separate range for each character, containing ONLY that character, like this?

#### AA, OQ. 77, %%, FR, MM, 22, \*\*....

In theory, you can; unfortunately, the Char Map gadget can hold only 79 character! Thankfully, today's MIDI instruments are constructed around popular microprocessors that use ASCII. Perhaps a future version of Music-X will address these limitations.

Here are some examples of constructing character maps.

#### Example 1: Not Too Tricky

Suppose your MIDI instrument uses values 28-36 for the digits '1' through '9', 37 for '0', 53-78 for small letters a-z, and 83-108 for capital letters A-Z.

#### 100/1B,19,00,126/34.az,14F/52,AZ,16D/7F

The ranges are 0-27 (\$0-\$1B) uniouched, the digits '1' to '9," the digit '0' in its own range, 38-52 (\$26-\$34) unlouched, the letters a-2, 79-82 (\$4F-\$52) untouched, and the letters A-Z. To be safe, we specify that the remaining values 109-127 (\$6D-\$7F) translate to themselves.

#### Example 2: Those Pesky Zeroes

The Oberheim Xpander's patch names are stored in a way that causes problems for the Librarian. The patch name is 8 characters long, but each character is stored in a two-byte field. Thus, the name appears to have a zero stored in every other byte. When Music-X reads the 16 characters as a name, and tries to print the name on the screen, it stops printing after the first character. Why? Because zero means "end of character string" in most Amiga programming languages, as all C programmers know. How can I print the entire patch name if the first zero effectively cuts off the rest of the name?

To remedy this, I used a Character Map to translate zeroes into space characters (ASCII 520). It leaves all other characters unrouched. Here's the Character Map, assuming that the Xpander uses plain ASCII for the test of its characters (which it does):

#### \20\20,\01\7F

Now the patch names are displayed correctly, though a blank space appears after each of the 8 characters. We can eliminate the last space at least by claiming that the name length is 15 instead of 16.

Just for fun, let's modify our Char Map to translate capital letters into small letters. The Xpander uses only capital letters internally. On the ASCII table, capital letters are found in positions 65-90 (\$41-\$5A), so we isolate this range:

120120, 01140, AZ, 5817F

and then translate the letters to lower case:

(20)20, (01)40, az, (5B)7F

#### Example 3: Nybbling at the Yamaha SPX-90

The Yamaha SPX-90 digital effects unit stores its 16-character patch name in 32 bytes of data. Each character is represented as a two-byte quantity, with only the least-significant 4 bits used in each byte. For example, suppose the first two bytes of the patch name are 4 and 5. In binary, these numbers are 00000100 and 00000101. Extract the least-significant 4 bits in each to get 0100 and 0101. Paste them together to get 01000101. This is the number S45 which is the character 'E' on the ASCII table.

Anyway... can we make Music-X extract this patch name? Turning to the manual, we find that Music-X can indeed understand this "nybblized" data (a nybble is half a byte) by using the Y data variable (page 384). It can grab two bytes, extract their least-significant nybbles, and join them together into a single byte—exactly what we need. Hooray!

Unfortunately, our success is short-lived Music-X assumes that the first byte arriving is the least-significant, and the second is the most-significant. This is exactly the opposite of what the SPX-90 sends! In other words, in our \$45 example above, Music-X will interpret this as the number \$54 (the letter "T"). Our method won't work.

In fact, our method has a second problem. If we use the Y variable to extract nybbles, this changes the actual data stored by Music-X, and therefore alters the value of our computed checksum (K variable)! In order to make this work, we would have to disable the checksum handling in our protocol, and treat the checksum as an ordinary data byte.

As of this writing, I still have not managed to get Music-Xto understand SPX-90 patch names. If anybody else can figure out a method, please contact me

#### Conclusions

I hope that this article has made protocols less mysterious for you. Eve now written protocols for about 10 different instruments (including some fairly old synthesizers), and the process gets easier each time. Don't be atraid to experiment: you can't break anything by writing an incorrect protocol. As with any computer data, however, make sure to back up your patches in some other way before experimenting, in case you accidentally overwrite something. Good luck!

#### ADDENDUM: A Few Bug You May Encounter (Music-X 1.1)

I encountered a few bugs while using the Librarian and Protocol Editor. If you are editing an existing library's protocol, and you Load... a new protocol and return to the Librarian Page, the old protocol's name will still be listed under the "--Format----" label. In fact, if you now re-enter the Protocol Editor, the new protocol's name has been changed to the old name (although the rest of the new protocol is OK).

If you choose Load... in the Librarian, and then click on CANCEL in the requestor, your current library disappears from the screen (and is replaced by "No Page"). I consider this a bug because "CANCEL" should return the program to the exact state if was in before the requestor appeared. To bring, back your library, use the Set Display command in the Edit menu.

If you are in the Protocol Editor and you choose Load... or Save... from the File menu, sometimes the file requestor's Directory gadget contains an incorrect value. This causes the message "—Not a valid directory—" to be displayed in the requester. If you examine the directory name, you will find that the end of the directory name has been replaced by the PROTOCOL's name! This happens it your directory name is longer than 32 characters

I have managed to put Music-X into an infinite loop (although its menu bar keeps working) by choosing Load in the Librarian when there is already a library loaded. The problem is intermittent and may be related to the above directory bug.

#### About the Author

Daniel Barrett has been working in electronic and computer music since 1979, and was the moderator of the Internet Music-X electronic mailing list (now defunct). He is currently a Ph D candidate in computer science at the University of Massachusetts, and may be reached by electronic mall

as barrett@cs.umass.edu (Internet) or

>internet/barrett/lics/umass.edu (Compuserve). Special thanks go to Mike Metlay for the use of his two Prophets.

# AudioProbe

#### by Jim Olinger

Since the Amiga has the best built-in sound capabilities of any personal computer, it's rather surprising how little attention. Amiga sound programming has received. This may be so because most people are visually oriented. Humans are usually aware of what they are seeing. Sound is often subliminal. Hearing is a more subtle, primal sense.

Or maybe it's just because it's so easy to play sampled sounds on the Amiga that few programmers have explored the alternatives, which call for diving deeply into Exec and 1/O devices. Most games seem to use sampled sounds exclusively.

There are two general techniques for producing sounds with a computer sampling and synthesis. Each has advantages and disadvantages.

Sampling consists of playing back digitized sounds. The most realistic musical instrument sounds and most impressive sound effects are usually samples. The Amiga's advanced audio chips usually make sample playback a "fire and lorget" procedure. The CPU can pass the sampled sound data and play instructions to the audio hardware and go on about its other business.

Since samples are essentially audio recordings, a sample user faces all the problems of an audio engineer. The sound is usually recorded, digitized and then manipulated with sample editing software before it is ready to use. It's no wonder that most games include "sound designer" in the credits! Samples also tend to be large; 16 to 32K per sample is common.

Synthesis is the process of manipulating relatively simple waveforms. The waves don't take up nearly as much memory as samples, but more attention from the CPU may be required. Synthesized sounds aren't as realistic as samples (although you might ask what a "real" phaser or hyperspace jump sounds like), but a synthesized sound might be perfect for a cockpit alarm or for an instrument in a musical soundtrack.

Both sound generation techniques are valuable, and they are frequently used together. "Star Wars'' is an excellent example. Every environment, such as Luke's planet. Obi-Wan Kenobi's home and the Death Star, had a characteristic background sound produced by simple analog synthesizers. Starship engines were derived from a recording of the Goodyear blimp. Darth Vader's voice was produced by radical filtering and electronic processing of James Earl Jones' voice. The unnaturally regular hissing of Darth's breath was another synthesizer sound. R2-D2's voice was a wild mixture of human voices, puppy cries and synthesizers. And so on.

The accompanying program, Audiol'robe1, was written to explore the application of analog synthesizer concepts to Amiga sound generation. It dynamically manipulates pitch and volume the two simplest sound parameters). It is oriented toward processing simple waves, but it will also work with sampled sounds. In fact, most programmers will probably use the AudioProbel techniques to increase the utility of individual samples by dynamically modifying the sample to produce different sound effects.

Before we get into the program, let's examine some basic synthesizer concepts and the Amiga audio hardware.

#### Analog Synthesizer Basics

The first electronic instrument was the Telharmonium, which was intended to send music to subscribers over telephone lines. It was invented in the 1890s. This service never took off, but the Telharmonium was the basis for the Hammond organs, developed in the 1930s. Several other electronic instruments were invented in the early decades of this century.

"Classical" electronic music emerged after World War II. It was based on manipulating sounds with the newly available tape recorders, and was actually closer to modern samplers than to the analog synthesizers which appeared a few years later.

The modern commercial synthesizer was developed in the late 1960s by Robert Moog. The first instruments filled a significant part of a room. Sounds were "programmed" by connecting individual components with a tangle of patch cords. The early "Moogs" (practically a synonym for "synthesizer" at the time) were custom-built, temperamental, and very expensive.

The first attordable synthesizer was the Mini-Moog (produced from 1970 to 1981), which combined the large instrument's most often-used components into a suitcase-sized package. It contained an organ-style keyboard, voltage-controlled oscillators (VCOs), a noise generator, a mixer, a voltage-controlled filter (VCF), a voltage-controlled amplifier (VCA), and two envelope generators. Figure 1 is a block diagram of a generalized analog synthesizer voice, similar to a Mini-Moog. A Mini-Moog could play only one note at a time. Modern synthesizers consist of a number of these voices, allowing several notes to be played simultaneously.

Many musicians still prize their Mini-Moogs, which can produce sounds that are difficult to recreate on any other synthesizer:

The Mini-Moog sound sources are three voltage-controlled oscillators, which produce simple, but harmonically rich, waveforms, and the noise generator, a circuit which creates a "hiss." like radio static. The number of complete wave cycles the oscillators generate each second determines the pitch of the sound. Noise, being a set of random, non-repeating frequencies, has no distinguishable pitch.

### Sound Synthesis Experiments in Modula-2

The waves from the VCOs are the basis of most instrument sounds while noise is useful for wind or surf effects, percussion, gunshots, or adding "breath" to flute sounds

Figure 2 shows some common synthesizer waveforms. Compare them to the acoustic instrument waveforms in Figure 3.

The mixer combines the sound sources for processing by the filter and amplifier

The voltage-controlled filter is a "super tone control." It passes all frequencies below a certain "cut-off" point and removes all frequencies above that point. Filtering a waveform changes its shape, Since the waveshape determines the timbre of a sound, the filter is the primary timbre modifier

The voltage-controlled amplifier controls the final volume of the sound.

One of the oscillators could be switched from voltagecontrolled operation in the audio-range (20-20,000 Hertz) to low frequency output (0.2-20 Hertz) which could be directed to the VCOs to produce vibrato and/or to the VCF to create periodic timbre changes.

The envelope generators output voltages which vary over time. One envelope generator is connected to the filter, allowing dynamic timbre variations. The other envelope generator controls the amplitier.

Figures 4a and 4c are drawings of the waveforms produced by an organ and guitar playing three staccato (detached) notes, with high, medium and low pitches. Figures 4b and 4d are graphs of volume changes over the time the notes are being played and were obtained by connecting the highest volume points of the waveforms. These graphs are called "envelopes" and they represent the characteristic "shape" of an instrument note.

An organ note starts playing at full volume as soon as a key is pressed, continues playing at that volume as long as the key is held down, and ends abruptly when the key is released. A guitar note starts with maximum volume when the string is plucked and the volume decreases smoothly and fairly quickly.

A trumpet note (Figures 4e and 4f) begins with a quick smooth volume increase, then drops back to a steady level. When the player stops blowing, the volume quickly, but not instantly, decreases to zero.

The envelope is an extremely important part of an instrument's characteristic sound. One way of producing unique sounds is playing an instrument's waveform with the envelope of a different instrument. For example, a trumpet waveform played with an organ or guitar envelope will sound more like an organ or guitar then a trumpet. A trumpet envelope is the model for the ADSR (Attack, Decay, Sustain, Release), the most popular envelope generator (Figure 5). When a key is pressed, the output voltage climbs from zero to maximum at a rate controlled by the "attack time" control. After reaching maximum, the voltage drops to the "sustain level" over the "decay time." It remains at the sustain level until the key is released and talls to zero over the "release time."

The AudioProbel program's ADSRs have an additional parameter, "sustain time," which controls the amount of time the envelope remains at the sustain level.

Oscillators, filters, and amplifiers had been used in "electronic music" for over 20 years when the Mini-Moog was developed. They were everyday radio equipment. "Voltage control" was the key difference. The earlier components had to be manipulated manually. For example, a musician had to turn an oscillator's frequency knob to change pitch. Playing a scale required recording each individual note and then splicing the tape.

Voltage control changed all that. Voltage from the keyboard controlled oscillator frequency. Voltages from the envelope generators shaped the response of the filter and amplifier. This gave the musician real-time control of pitch, timbre, and volume.

The Mini-Moog and the ARP Odyssey, a similar synthesizer built by Moog's principal competitor, ARP Instruments, moved electronic music from the recording studio into the world





of live performance. Most modern synthesizers still use the sound-generating techniques devised for these pioneering instruments.

#### **Computer** Synthesis

Many analog synthesis concepts relate directly to computer synthesis.

A computer can't produce analog waveforms directly. Instead, a waveform is represented by a string of numbers, usually called a wavetable. To create a wavetable, one must divide the time axis of a graph of the waveform into equal segments. The points of the waveform at each time interval are called samples.

To play a sound, the computer scans the wavetable, sending each sample to a digital-to-analog converter (DAC). The DAC output is sent to an amplifier, then to a loudspeaker. The frequency of the output waveform is determined by the speed at which the wavetable is scanned.



Analog oscillators contain circuits to produce a limited number of waveforms, such as sawtooth, square, and pulse waves. The raw waveforms are good for producing some pipe organ timbres, but are too harshly "electronic" for most musical applications. The filter is used to tailor the waveform to create more pleasing timbres.

Computers usually don't have voltage-controlled filters to alter waveforms. Instead, the wavetable can be loaded with any waveform. One analog feature is lost: it's difficult to change a computer waveform dynamically. This can be done with a "double buffering" technique where a new wavetable is calculated while another wavetable is being played. The second wavetable is then played while the first is recalculated. A detailed discussion of double buffering will have to wait for another article.

Voltage-controlled amplifiers can be computer-simulated by adjusting the amplitude of the samples in the wavetable or by controlling the digital-to-analog converter's output level. The second method is preferred, if the hardware supports it. To minimize distortion, the wavetable should use the maximum available sample range and volume should be controlled by adjusting the DAC output. Envelope generators, low frequency oscillators, and other controllers are simulated in software.

#### Amiga Audio Hardware

The Amiga has four independent hardware audio channels ("voices"). Each voice contains a direct memory access (DMA) channel, an eight-bit digital-to-analog converter and an amplifier Channels 0 and 3 are connected to the left stereo output while channels 1 and 2 are connected to the right output jack.

Complex audio effects can be created by using one audio channel to modulate the amplitude or frequency of another channel. We will concentrate on DMA playback of wavetables. Each audio channel is controlled by registers containing control data, the wavetable starting address, the wavetable length, the output volume, and the sample playback period. The output volume ranges from 0 (silent) to 64 (maximum).

The playback period specifies the number of system clock ticks to wait before sending another sample to the DAC. One system tick is 0.279365 microseconds. The DAC requires 124 ticks (34.642 microseconds) to perform a conversion. Therefore, the minimum period value is 124 ticks. Since the frequency of a sound is the number of complete waveform cycles per second, the output frequency is determined by the wavetable length and the sample period. Note that frequency increases as period decreases. Here is the equation for calculating the period:



The audio software is implemented as a standard Amiga input/output device. It is controlled by standard I/O device commands, as described in Part I Chapter 4 (I/O) of the ROM Kernel Manual.

#### The AudioProbel Program

AudioProbe1 consists of several modules, written in Benchmark Modula-2. AP1Voices contains all the procedures for allocating, playing, modifying, and releasing voices. AP1Envelopes implements volume and frequency envelope generators for each voice. AP1Waves calculates several basic synthesizer waves, noise and user-specified waveforms. Noise is the basis for a large number of sound effects. The AudioProbe1 main program is primarily control logic and procedures for demonstrating features of the other modules.

AudioProbe1 can read sampled sounds from disk, but it also generates simple synthesizer waveforms. It includes numerous procedures for experimenting with waveforms. The AudioProbe1 procedures for allocating, playing, stopping, and releasing voices are derived from the program in Len White's article "Digitized Sound Playback in Modula-2" (Amazing Computing, May 1989).

The most important addition is the ability to modify the frequency and volume of sounds while they're being played. When I started writing the program, I expected this to be simple. It wasn't. An obvious way of changing frequency or volume is to play a voice, stop it, change the desired parameters, and start the altered voice. There is a distinct "pop" when the old voice is turned off. It's impossible to make smooth changes with this method.

A voice is controlled by sending an I/O request to the audio device with the voice parameters in an IOAudio record. How about changing the parameters in this record while the voice is playing and sending another I/O request? This causes two problems. First, it doesn't work. The frequency and volume stay the same, Even worse, the computer crashes when the voice is turned off. The "I/O" chapter of the ROM Kernel Manual warns, "I/O request blocks, once issued, must not be modified or reused until they are returned to your control by Exec." Exec doesn't release the request block until the voice has stopped playing.

Each of the four voices is allocated by opening a communications port, creating an I/O request, opening a copy of the audio device for the channel, and sending an "allocate" command to the device.

To control a playing voice, one must create another I/O request, with its own communications port and copy of the audio device. The "period" and "volume" fields of this "control" I/O request are set to the desired values and the "unit," "allocation key," and "data" fields are loaded with data from the I/O request block of the channel to be modified. This "change period/volume" command is sent to the control I/O request's copy of the audio device.

The device procedure "BeginIO()," rather than "DoIO()," is used to play and alter voices because "BeginIO()," unlike "DoIO()," doesn't reset the device flags in the I/O Request.

| 900000         |                        | $- \cap \cap -$ |
|----------------|------------------------|-----------------|
| 4a: Staccato o | rgan notes             |                 |
| AD ADADA       | nvelope of staccato or | gan notes       |
| det Staccato g | uitar notes            |                 |
| dd: Volume e   | nvelope of starcate gu | itar notes      |
| -VWMM          |                        | Volume Time     |
| $\frown$       |                        |                 |



#### Operating AudioProbel

Since AudioProbel is a program for experimenting with sounds, it has a simple character-based user interface to allow maximum flexibility (Figure 6). If AudioProbel is run from a console window, like the window created for the "Run Main Module" function of the Benchmark editor, the program is controlled by single keypress commands. If it is run from the Shell or CLI, the "Return" key must be pressed after the command key to send the keystrokes to the program.

"Select Waveform" calls procedures which create simple wavefables. It also can load a sampled sound from disk. When a waveform is selected, it is played for two seconds at "Sample Volume", "Load Sample" is for "raw" samples. It will not work correctly with IFF format samples.

| igure Six                                                                                                               | AudioProbe1 Controls                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                         | and the second state of th |
| savel                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Reducation (<br>Reducation)<br>of those                                                                                 | lisSurren Cavellan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| New Carlos                                                                                                              | Sequences and the second second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| and: in                                                                                                                 | ter in the state of the state o |
| Voltand Anton<br>I State S<br>I State I Petto<br>I State I Petto<br>I State I Petto<br>I State I State<br>I State State | nom gradne grad of Artholis a frankrik<br>Gane Follskansk a ganska Artholis a frankrik<br>Men Valska Kolma Britaga Barris (* 1990) 1990 Britaga<br>Frankrik (* 1992) 1990 Britaga (* 1990)<br>Frankrik (* 1992)<br>Frankrik (* 1992)<br>Follower (* 1992)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| All of the second                                                                                                       | Property and the loss of the l |
| é Moral I In<br>A Altara Tra                                                                                            | <ul> <li>Complete and</li> <li>Compl</li></ul>                                                                                                                                                                                                                                                                                                                   |

Free sampled sounds can be found on public domain disks and bulletin boards. A number of companies listed in the "Music" section of AC's Guide to the Aniga sell disks of sounds. Some games, such as Falcon, have sound files which can be used for experiments. Of course, it's probably illegal and certainly unethical to use other people's game sounds in your own commercial product. Numerous audio digitizers, some costing less than \$100, are available. Programs which will generate "samples" also exist. The AudioProbe1 "noise" waveform is an example of a computed "sample."

Two of the available waveforms, "Clarinet" and "Flute," were obtained by digitizing drawings of the waveforms from a music book and reading evenly-spaced points with the co-ordinate feature of DeluxePaint III. Wave sample values also could be determined by drawing the wave on graph paper.

The waves "Sine," "Sine32," and "Sine64" demonstrate the differences in timbre between the same waveform represented by 20, 32, and 64 sample values.

"Set Frequency" controls the playback period. For short waveforms, frequency directly corresponds to the pitch of the output sound. However, since pitch is determined by both period and wavetable length, and the minimum period is 124 system clock ticks, long wavetables can't be played at high frequencies. For example, the length of the longest wavetable that can be played at 440 Hertz ("middle A") is 64 bytes. This length is sufficient for sumple single-cycle waves.

If the period is set to less then 124, the audio hardware won't have enough time to retrieve the next data sample and the previous sample will be reused. This produces unexpected audio effects. All the frequency-related procedures in the AP1Voices module avoid this problem by setting any period values less than 124 to 124 and writing an error message. I call this adjustment "period clipping."

Sampled sounds, with wavetable lengths of 16K to 32K, contain many wave cycles, making the exact playback pitch difficult to calculate. When playing long wavetables, a frequency under I Hertz should be used. Attempting to play a wavetable longer than 28,866 bytes at 1 Hertz will cause period clipping.

"Set Volume" adjusts the playback volume from 0 (silent) to 64 (full). Both frequency and volume are "base" values, which can be increased or decreased by the envelope generators. There are two independent envelope generators. One modifies frequency while the other modifies volume.

"Modulation" is the maximum variation from the base value, expressed in percent. Positive and negative modulation amounts are allowed. The maximum volume modulation amount is -100% to +100%. A frequency modulation amount of +100% doubles the frequency, raising the pitch by one octave, while 100% halves the frequency, dropping the pitch by one octave. Frequency modulations of several hundred percent are possible.

"Attack Time," "Decay Time," "Sustain Level," "Sustain Time," and "Release Time" control the envelope shape. "Set Sample Prequency" and "Set Sample Volume" adjust frequency and volume for playing samples without using the envelope generators. "Set Sample Cycles" controls the number of times a sample will be repeated. These functions are used mainly for auditioning new samples.

"Play Broken Chord" is a stereo demonstration. It starts each voice individually, building up to a four-note chord, then removes the notes individually. The envelope generators are not used. "Play Chord" plays a four-note chord. Prequency and volume can be modified by the envelope generators. If the frequency envelope is applied, the result is similar to a slide guitar chord. A major chord, containing the first, third, fifth, and octave notes of a major scale, is produced. The root note of the chord is determined by the "Frequency" parameter.

"Play Note" plays a single note, controlled by the "Frequency" and "Volume" parameters and the envelope generators.

The notes used in the chord experiments are computed using the relationships of the equal-tempered musical scale. In this system, the frequency of each note is the twelfth root of 2 (1,059463) times the frequency of the provious note. Figure 7 shows two octaves of notes in standard concert luning, where "middle A" is 440 Hertz. The lowest scale note is set from the "Frequency" parameter.

"Play Siren" demonstrates volume and frequency changes without using the envelope generators.

"Play Sample" plays the current wavelorm, controlled by the "Sample Frequency," "Sample Volume," and "Sample Cycles" parameters. This is primarily an "audition" function. The envelope generators are not used.

#### Experiments

Here are a few pointers before we get into the experiments. In the unlikely event that you haven't already hooked your Amiga's audio outputs to a stereo, I strongly recommend you do so before experimenting with AudioProbe1. The distortion from the tiny amplifier and speakers in your video monitor can give you extremely misleading results. You will also miss the stereo effects if you use a mono monitor.

AudioProbe1 is almost as complex as a Mini-Moog, which, to the beginner, is complex indeed. Many functions interact, often in ways which aren't immediately obvious. The Mini-Moog provides instant feedback. When a switch is flipped or a knob is turned, something (usually) happens instantly. AudioProbe1 is controlled by pressing keys to select menu items and typing numbers. This is more abstract than operating controls directly.

To avoid becoming disoriented, experiment with changing one parameter at a time. Try many values of each parameter and many combinations of parameters. Don't be afraid to try strange combinations. In synthesis, many impressive and useful sounds have been discovered by accident.

It something unexpected happens, compare the relationships of all the elements. One common problem is envelope conflicts. If a sound has a long frequency envelope and a short volume envelope, the volume envelope will cut the sound off before the frequency envelope is finished.

The "Chord" and "Siren" functions have maximum pitches an octave above the "Frequency" parameter ("Frequency" \* 2). The Frequency Envelope Generator can increase

| Figure Seven<br>Equal-Tempered Scale<br>Frequencies |                       |  |  |  |
|-----------------------------------------------------|-----------------------|--|--|--|
| Note                                                | Frequency             |  |  |  |
| - 01                                                | 1410.0                |  |  |  |
| 79.18                                               | 460.2                 |  |  |  |
| 3                                                   | 8438                  |  |  |  |
| C                                                   | \$21.9                |  |  |  |
| 1.4                                                 | 554.4                 |  |  |  |
| 20                                                  | 887.3                 |  |  |  |
| 2.00                                                | 6221                  |  |  |  |
| - P-                                                | = 5 \ - 7             |  |  |  |
| P1                                                  | e18.5                 |  |  |  |
| 21                                                  | 1.0-0.1.1             |  |  |  |
| C.                                                  | 74.417                |  |  |  |
| 0.0                                                 | 8.10.10               |  |  |  |
| 1.11                                                | 200 0                 |  |  |  |
|                                                     | 0.010                 |  |  |  |
| 1.1                                                 | 214-1                 |  |  |  |
| -                                                   | 104N                  |  |  |  |
|                                                     | 3.1.000.0             |  |  |  |
| 73.                                                 | -1.0.00 ml            |  |  |  |
| 716                                                 | 1000                  |  |  |  |
|                                                     | 1.000                 |  |  |  |
| 0                                                   | TALL V.               |  |  |  |
| 0.0                                                 | A REAL PROPERTY AND   |  |  |  |
|                                                     | 1 Bellen              |  |  |  |
|                                                     | 1463                  |  |  |  |
| 10.0                                                | and the second second |  |  |  |

pitch indefinitely, based on the "Modulation Amount" parameter (+100% modulation = 1 octave, +200% modulation = 2 octaves, etc.). The maximum frequency before period clipping occurs is calculated by the equation: Maximum Frequency = 28867 / WaveLength. The following table gives the frequencies for the built-in AudioProbe1 waveforms.

| Waveform<br>Name | Waveform<br>Length | Max Note<br>Frequency | Max Chord<br>Frequency |
|------------------|--------------------|-----------------------|------------------------|
| Sine             | 20                 | 1443                  | 721                    |
| Sine32           | 32                 | 902                   | 451                    |
| Sine64           | 64                 | 451                   | 225                    |
| Triangle         | 32                 | 902                   | 451                    |
| Flute            | 62                 | 465                   | 232                    |
| Square           | 20                 | 1443                  | 721                    |
| Clarinet         | 52                 | 555                   | 277                    |
| Sawtooth         | 32                 | 902                   | 451                    |
| Noise            | 4096               | 7                     | 3                      |

Setup: Set "Sample Volume" to 64. Select "Sawtooth" wave. While the "Audition" note is playing, adjust the volume on your stereo to a comfortable level.

Waveform Resolution: Set "Sample Volume" to 64. Select the "Sine," "Sine32," and "Sine64" waveforms and compare their timbres. Notice that Sine32 and Sine64 are practically indistinguishable while Sine has a distinct high-pitched whine added to the fundamental sound. This suggests that 32 samples is the optimum sample length for simple single-cycle waveforms.

Waveform Timbres: Set "Sample Volume" to 64. Compare the timbres of waves with similar waveforms (see Figures 2 and 3) such as "Sine32," "Triangle," and "Flute" or "Square" and "Clarinet" (named "Bright Clarinet" in figure 3d).

Stereo Voices: Select any waveform. Set "Frequency" to avoid period clipping. Set "Volume" to 64. Play "Broken Chord". Notice how the individual notes appear in alternating speakers.

Siren: Select any waveform. Set "Frequency" to avoid period clipping. Play "Siren." Besure to try this with all waveforms, using numerous frequencies, including extremely low frequencies

Volume Envelope: Select the "Sine32" waveform. Set "Frequency" to 440 and "Volume" to 0. Set "Frequency Envelope Modulation" to 0% "Volume Envelope" parameters are Modulation = 100%, Sustain Level = 50%, Attack = 0.5, Decay = 0.5, Sustain = 1.0 and Release = 0.5 Play "Note" and "Chord." Notice that the volume builds to full, drops back to half, sustains, and finally decreases to zero. Vary the Attack, Decay, Sustain, Sustain Level, and Release parameters and observe the change. Set "Volume" to 16 and "Volume Envelope Modulation" to 75%. Play "Note." This time, the volume starts at 16 and builds.

Frequency Envelope: Select the "Sine32" waveform. Set "Frequency" to 110 and "Volume" to 64. "Frequency Envelope" parameters are Modulation = 100%, Sustain Level = 50%, Attack = 0.5, Decay = 0.5, Sustain = 1.0 and Release = 0.5. Set "Volume Envelope Modulation" to 0%. Play "Note" and "Chord". Vary the "Frequency Envelope" parameters Try "Frequency Modulation" = +200% and -200%.

Volume and Frequency Envelopes. Vary the "Frequency Envelope" and "Volume Envelope" parameters with non-zero modulation amounts. Loony Tunes: Select the "Sine" waveform. Set "Frequency" to 110 and "Volume" to 0. "Frequency Envelope" parameters are Modulation = 200%, Sostain Level = 100%, Attack = 1.0, Decay = 0.0, Sustain = 1.0 and Release = 0.5. "Volume Envelope" parameters are Modulation = 100%, Sustain Level = 100%, Attack = 1.0, Decay = 0.0, Sustain = 1.0 and Release = 0.5. Play "Chord", Does this sound a bit like the beginning of a certain cartoon?

Noise Experiments: Noise is a basic synthesizer waveform that is more like a sample than a simple waveform. The following experiments demonstrate some of the ways noise can be used.

Tet Takeoff (heard from ground): Select "Noise" waveform. For a single-engine jet, set "Frequency" to 0.1 and "Volume" to 0. "Frequency Envelope" parameters are Modulation = 200%, Susrain Level = 100%, Attack = 4.0, Decay = 0.0, Sustain = 12.0 and Release = 0.0. "Volume Envelope" parameters are Modulation = 100%, Sustain Level = 100%, Attack = 4.0, Decay = 0.0, Sustain = 6.0 and Release = 6.0. Play "Note:" For a multi-engine jet, set "Frequency" to 0.025 and play "Chord." Adjust any or all of these parameters to your own taste.

To increase realism, play one or two voices with the "Noise" waveform and add a high pitched whine by playing additional voices with the "Sine" or "Triangle" waveforms. This will require additional programming (see "Improvements").

let in Flight, Select "Noise" waveform. For a single-engine jet, set "Frequency" to 0.1 and "Volume" to 32. Set both "Frequency Modulation" and "Volume Modulation" amounts to zero. Control the time the sound plays by adjusting the "Sustain Time" for either the Frequency of Volume Envelope Generator. Play "Note." For a multi-engine jet, set "Frequency" to 0.05 and play "Chord "

#### Improvements

AudioProbel wasn't written as a music program, but music entry and editing capabilities could be added. However, although the Amiga has very good sound-producing capabilities (for a computer), you would probably getbetter results by buying a synthesizer, MIDI interface, and sequencer software if your primary interest is music.

AudioProbeT doesn't provide the instant feedback of a Mini-Moog or ARP Odyssey synthesizer. This could be corrected by creating an Intuition-based control panel, which could be very useful for sound design experiments.

Data for arbitrary waveforms is created by manually determining the sample values. The wave could be entered by drawing it on the screen with the mouse. A procedure to save wave data to disk could be added. Procedures for reading and writing IFF sound files could also be added.

The ADSR envelope generator has the smallest number of parameters that can represent a complex instrument envelope, such as a trumpet envelope. It was popular with early synthesizer designers because if provided considerable flexibility with a minimum of components. With software envelope generators, we can have any number of stages and levels. In fact, the AP1Envelopes module is written so that the only modifications required to change the number of envelope stages are changing the limits of the "Time" and "Level" arrays in the "EnvelopeRec" data structure and adding statements to the "SetEnvelope()" procedure to initialize the additional stages.

For simplicity. AudioProbeT uses the same waveform, frequency, volume, and envelope generator parameters for all four voices. Since the hardware for each voice is independent, all the controls for each voice could also be independent. One distinct problem with the AudioProbel envelope generators is that they take over control of the program until the envelope cycle is complete. This might be fine for short sound effects, but it could interfere with other activities, such as screen redraws, if a sound has a long envelope. One way of dealing with this problem would be to move envelope generator updates into the normal processing loop. Since the Amiga is a multi-tasking machine, a better solution would be to create a separate task to operate the envelope generators.

#### The End (Of The Beginning)

This has been a brief introduction to sound synthesis. As with all skills, expertise in synthesis requires continued study and practice. Develop your ears. Listen to all the sounds around you and consider how they could be synthesized. Analyze the basic components of a sound and determine how they can be manipulated to produce the effect you want. Be alert for happy accidents. Many discoveries have been made on the way to something else.

An amazing and wonderful world of sound awaits you

#### Bibliography

Amiga Hardware Manual: Chapter 5 - Audio Hardware, pp 5-1 to 5-31

Amiga ROM Kernel Manual: Part III Chapter J - Audio Device, pp 3-1 to 3-28

Amiga ROM Kernel Manual: Part III Chapter 2 - Timer Device, pp 3-29 to 3-41.

Learning Music With Synthesizers. David Friend, Alan R. Pearlman, Thomas D. Piggott: Hal Leonard Publishing Corporation, 1974.

"Digitized Sound Playback in Modula-2", Len A. White, Amazing Computing (May 1989), pp 45-47.

#### Listing One AudioProbe1.mod

| - Contract ( Leavernood ) -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| $ \begin{array}{c} 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 $                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| (2) We associate and the second se                                                                                                                                                                                                                                                     |
| $ \begin{array}{c} (v_1,w_1^{*}) = (v_1,v_2,w_2,\dots,(w_{n-1},w_1)) \\ (v_1,v_2,\dots,(w_{n-1},w_{n-1},w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-1},w_{n-1},w_{n-1},w_{n-1},w_{n-1},\dots,(w_{n-1},w_{n-$ |
| and a second sec                                                                                                                                                                                                                                                  |

```
11 M Andrew College and a standard with the

 A providence of the second seco
 A BEELLE OF THE DESCRIPTION OF T
 A Lyper At MCHERE
 \begin{array}{l} & & \\ & & & \\
 re soloni an even portition +1
 \begin{array}{c} (1-\omega r_{1})+(\nu_{1}\omega_{1})r_{2}+(1-\omega r_{1})r_{2}-(1-\omega r_{1})r_{2}-(1
 TT AND THE PROPERTY AND A DESCRIPTION OF A PERSON OF A
 FIT A STATE AND Salaring of the second strategies and the second
 ERP
EDGE EPERTORI.

 If a fail of the residuation of a link of digeneration of the second seco
 turn total in Lightcale (1971)
 with Alexandron and a state of the state
 n and a second s
 DEVOLUTION BUREFERST AND APPEND
 Constanting of the second
```

## Management, Inc.

### Amiga Service Specialists

Over four years experience! Commodore authorized full service center. Low flat rate plus parts. Complete in-shop inventory.

> Memory Management, Inc. 396 Washington Street Wellesley, MA 02181 (617) 237 6846

> > Circle 103 on Reader Service card.

```
Prove P
```

```
CONTRACTOR OF A
 (1, \dots, 1, 1)

(1, \dots, 1, 1)

(1, \dots, 1, 1)

(1, \dots,
 Contractor
 Transition I'm
 \begin{array}{cccc} & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & \\ & & & & \\
(A.S.S.) Intelligeneering (A.S.S.S.S.
```

```
DE LE VILLE DE UN
 All and a second -----
 Tanana
 \begin{array}{c} \max_{\substack{i=1,\dots,n\\ i=1,\dots,n\\ aga
Talan (rendra)
 \begin{array}{c} (1) \\ = (1 + 2^{-1})^{-1} (1 + 2^{-1})^{-
 \begin{array}{c} (0, 1, \dots, 1) & (0, 1, 2) & (0, 1, 2) \\ (0, 1, 1, 2) & (0, 1, 2) & (0, 1, 2) \\ (0, 1, 2) & (0, 1, 2) \\ (0, 1, 2) & (0, 1, 2) \\ (0, 1, 2) & (0, 1, 2) \\ (0, 1, 2) & (0, 1, 2) \\ (0, 1, 2) & (0, 1, 2) \\ (0, 1, 2) & (0, 1, 2) \\ (0, 1, 2) & (0, 1, 2) \\ (0, 1, 2) & (0, 1, 2) \\ (0, 1, 2) & (0, 1, 2) \\ (0, 1, 2) & (0, 1, 2) \\ (0, 1, 2) & (0, 1, 2) \\ (0, 1, 2) & (0, 1, 2) \\ (0, 1, 2) & (0, 1, 2) \\ (0, 1, 2) & (0, 1, 2) \\ (0, 1
 the state of
 The state of the s
```

PROCESSION PROPERTY .

NAR-WARENZYAYI ARRAY (0.51) CO.DUTZOZY,

10.05124

| 14 Addition way              | NU #5             |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |
|------------------------------|-------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| ummheray (00)                | 1: 5051           | Savahuray-101               | 1.11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1111        |
| unumiliar av (02)            |                   | SAVEAUTON CT                | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ind i       |
| waynermay [04]               | 1. 1751           | WEYNALTOX .                 | 1.54                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1211        |
| COMPACT BY D41               | or 1150           | MEMORYTHNICE                | 1.5.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1041        |
| BOINGATION                   | an 1227           | WEIGHTTON ICS               | 1.5.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 120         |
| iohoheray jul                | OF LEVE           | VEDARTRY   ]                | 1.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1211        |
| without reapy 4/             | 0.0-1251          | WEINBRIGHT                  | 1.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 141.        |
| UNPREFEASITE.                | A CARLO           | NERVERY LAY 115             | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 140         |
| WARREEDAY FLI                | 11.1271           | SaterNethy.                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 120         |
| WARMERSAY 18                 | 1.1.1.221         | developing []               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 142.        |
| WARRACTOP 701                | 1 - 122.          | www.herm[17]                | 2 -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1711        |
| (-AbuActor(22)               | - 1251            | -minAccaylil                | 1.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1211        |
| PUMATTNY [36]                | ort 125)          | -myntriay111                | 1.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 125         |
| waywheray 26                 | 1: 1050           | WEYNALTOY [27               | £                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 205         |
| www.haray 200                | 0.0.10221-        | weyshirtsville              | )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0.044       |
| wownersy 30                  | ore BMGyr         | WAVNART BY 11               | )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0.010       |
| wateArray 171                | 10 m R00 /        | main(a), respectively [ ] ] | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 208         |
| WHITEACT BY 134              | - 8021            | naumhersey) (5              | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | D DTB -     |
| UNPOAREA9 36                 | 0.0.2057          | WEYRAPLAY 137               | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Q-018       |
| <b>WAYEREE AVITE</b>         | 78-20Th           | W0000239329                 | 21.778                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 9.071       |
| WARRAELAY 10                 | T. BARY           | wavefordy 41                | 3 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0.077       |
| walkarray 40                 | $\tau = 0.005$    | weveAreas 141               | 1.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 30.2        |
|                              | - X00 1           | -myshtray 41                | 1 -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 205.        |
| www.frrey146                 | 1 - 201           | Superity of the             | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 100         |
| www.mhrray 43                | 11.0001           | WIYEARTON ()                | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0.021       |
| weynwerwy 201                | 11 0061           | NEVENCEOVIEI                | 1.000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 100         |
| 1" DARE VANT                 | *)                |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |
| water and a second second    | a formate         | 10.5.**                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |
| - NORMONIA \$ \$400 1        | = 314720 (m)      | NUMBER OF A TA              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |
| and the second of the second | a. Which allows a | the crimble is station in   | Concession of the local division of the loca | a second de |

EN MANAGERET ( MANAGERED PROATE AV GERMANT AV )

```
TROPERINE SMARTHAN ()
```

RAIL.

warm Actor ( ARGAY ( Direl) of Shinonia

| BaCly                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| /*/ diffinit wave *i                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| waterArtaviDDT on UDD: waterArtavidat - 1001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| wateherstick of the matchersteres of the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| paymereavioal of MAA, manufermouth, or that                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| THEORETERS OF THE WARRANT TO THE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| "DADRAFFACIOR( = DTF) GADRAGGOIDE, I DE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| CADEROGALINE, MIL CADEROGALINE LINES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| DADELERGO ICI (199) GEOREPENTILI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| unlitheral (A) - (NT) - much-constants (                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| persenting of the second                                                                                                                                                                                                                                              |
| haven't white a new method with a set                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| SUMMETRY IN THE FEAT STUDIET STUDIET STUDIET                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| AUXINETOXINC: 1 244 AUXINEEDA.LT. 11 14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| ANANUTIANICS - ITTL ANNULTREADED - ILL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| PROPERTANTS OF FLAX REPORTAL AND A THE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| -sanawershifte: in Till senseershift) is This                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| shamaftershiller is this smooth buddles is it's                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| AMARKSAN TOL . TATL MARKANN TOL 197                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| warmharphy 23                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| wanescrap 181 14, woimhcrap 151 - 111                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| -0-64650 [76] -10", -009086509 [2" - 100]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| supertray[38] - 054, supertray [30] 1; 714;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| sweeksyay 101 on his, swymberns (41) on OCL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| NAMENET BY WE IN OTHER WAYNARTHY # 16 1661                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| waveleras while Phb, waveleraries is this                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| maxmetraviab; on Dir, wavefrappa7) on Jul                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| maximum available on other and an englished on por-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| wannhrighthy on dit, admhridelly of the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| WARRANTERPISE CONTRACTORS, WARRANTERPISE CONTRACTORS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| GADEREFAULTEL VI DZ1. GADEREFROISE I GUD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| WARRAFRAYISEL LOLD, WARRAFERYISE, 1001,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Waterscover ( 1916, Jackson ( 1917)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| advantead(RD) is full anotherad(10), is out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 17 Barry Scheme 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| manufater of Thicks.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| served at these or KDOR Incomestion and a ser                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| - WARNEY FITTE HIS PROVIDE TENSOR OF DESIGNATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Dos MageFluitz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| and many rates                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| PROPERTY & In Local Annual Print ( State )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| HOLESVED REPORTED OF TO SHIT LONG TO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| and the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Ve haladas and hand building but                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 17 CRUMINE CID WAVE GULLED **                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| AND PERSONAL PROPERTY OF A DESCRIPTION O |
| 1. dat num netenIdi. V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| CARD CAP PEDACI OF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| -W                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| W2150U110001 WeVE 1210 W0M0 111                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| The weak burn much bench an Posterin in y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| WEITERS (10001*10*)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| TA WALL AND MENDA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| EAVERAGE, BACORYDETTER GALPPROFELS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| U men                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Wa Vat Big # 17/12 Val 1/21                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| - Article (Ur;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| LMD. (#TP#1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Walkersone of the contra                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

```
wate Bactiner : 100,
-available first : Makes symbols is record first.
```

```
\begin{array}{c} \Delta D^{(0)} \Delta D^{(0)} \\ = D^{(0)} D^{(0)} D^{(0)} \\ = \Delta D^{(0)} D^{(0)} D^{(0)} \\ = \Delta D^{(0)} D^{(0)} D^{(0)} \\ = D^{(0)} D^{(0)} D^{(0)} D^{(0)} D^{(0)} \\ = D^{(0)} D^{(0)} D^{(0)} D^{(0)} D^{(0)} \\ = D^{(0)} D^{(0)} D^{(0)} D^{(0)} D^{(0)} \\ = D^{(0)} D^{(0)} D^{(0)} D^{(0)}
 and the second s
 17
 The second secon
 State 1 State
 The second second
 HING IS A REPORT OF
 \begin{array}{c} \sum_{i=1}^{n-1} \sum_{i=1}^
 Contraction of the second seco
100 M 101 101
make the faith and the
 stand summer.
 \begin{array}{c} & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ \end{array}
1.000
 2011 00.0
 \begin{array}{c} \frac{2}{2} \\ \left(\frac{1}{2} + \frac{1}{
```

 $\begin{array}{l} V_{1}(2) = 1 & \dots & 1 & \dots & 1 \\ V_{1}(2) = 1 & \dots & 1 & \dots & 1 \\ V_{1}(2) = 1 & \dots & 1 & \dots & 1 \\ V_{2}(2) = 1 & \dots & 1 & \dots & 1 \\ V_{2}(2) = 1 & \dots & 1 & \dots & 1 \\ V_{2}(2) = 1 & \dots & 1 & \dots & 1 \\ V_{2}(2) = 1 & \dots & 1 & \dots & 1 \\ V_{2}(2) = 1 & \dots & 1 & \dots & 1 \\ V_{2}(2) = 1 & \dots & 1 & \dots & 1 \\ V_{2}(2) = 1 & \dots & 1 & \dots & 1 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2) = 0 \\ V_{2}(2) = 1 & \dots & V_{2}(2)$ The design and in scale constraints for a state of the second scale of the second scal THE CARLING STREET 1011 The second state of the second st  $\begin{array}{c} (A_{1}^{(0)},A_{2}^{(0)},a_{1}^{(0)},a_{2}^{(0)},a_{1}^{(0)},a_{1}^{(0)},a_{1}^{(0)},a_{2}^{(0)},a_{1}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0)},a_{2}^{(0$ in (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) = (1+1) -11-I BERNYCOUR HOLD 100  $\begin{array}{l} \left( 1 + \frac{1}{2} \left( 1 + \frac{1}{2} \right) + \frac{1}{2} \left( 1 + \frac{1}{2} \left( 1 + \frac{1}{2} \left( 1 + \frac{1}{2} \right) + \frac{1}{2} \left( 1 + \frac{1}{2} \left( 1 + \frac{1}{2} \right) + \frac{1}{2} \left( 1 + \frac{1}{2} \left( 1 + \frac{1}{2} \right) + \frac{1}{2} \left( 1 + \frac{1}{2} \left( 1 + \frac{1}{2} \right) + \frac{1}{2} \left( 1 + \frac{1}{2} \left( 1 + \frac{1}{2} \right) + \frac{1}{2} \left( 1 + \frac{1}{2} \left( 1 + \frac{1}{2} \right) + \frac{1}{2} \left( 1 + \frac{1}{2} \right) + \frac{1}{2} \left( 1 + \frac{1}{2} \left( 1 + \frac{1}{2} \right) + \frac{1}{2} \left( 1 + \frac{1}{2} \right) + \frac{1}{2} \left( 1 + \frac{1}{2} \left( 1 + \frac{1}{2} \right) + \frac{1}{2} \left( 1 + \frac{1}{2} \right) + \frac{1}{2} \left( 1 + \frac{1}{2} \right) + \frac{1}{2} \left( 1 + \frac{1}{2} \left( 1 + \frac{1}{2} \right) + \frac{1}{2$ ١d+ ales partienter

CONTRACTOR OF CONTRACTOR Collection of Statement (1997) Interface Control (1997) Interface (1997) STORE TO DO NOT DO DON TO and the state of the second se \*E1 (14811100141 en internet Pointscorter Doutscorter VAP DAT DOTTEN. " Limenney Electron  $\begin{array}{c} (1) = 1 & (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + (1) + ($ introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introduceding
introducedi Transmission (Construction)
 Transmission (Constructi

(Remaining AudioProbe listings are on disk!-Ed)

### HAT HAS 16M COLORS, 24-BIT FRAME BUFFER +GENLOCK + FRAMEGRABBER + FLICKER-ELIMINATOR +PIP + VIDEO TITLER + 3D MODELLING SYSTEM



Il you're into video, IMPACT VISION-24 is truly a dream come true for your A3000 or A2000. It is the first multifunction peripheral specifically designed for the A3000's video expansion slot.

With the optional A2000 genlock slot adaptor kit, it also perfectly complements and enhances the A2000. Check out these features, all packed on a single Amiga<sup>®</sup> expansion board!



Separate Composite and Component Video (RGB + Sync) Genlocks. RGB genlock operates in the digital domain, for digitally perfect lity mixing, no color.

production studio quality mixing: no color bleeding, no ghosting, no artifacts

1.5MB Frame Buffer. Display 24-bit, 16 million color images on your Amiga monitor. On a multi-sync monitor, you can even display 16 million color images in non-interlaced mode!

Reattine Framegrabber/Digitizer, Freeze, grab and store (in standard 4096 or 16 million color IFF format) any frame from a "live" incoming RGB video source. Optional "RGB splitter" required to grab incoming composite or S-VHS video.

 Ricker-Elminator, Duplicates and enhances the A3000's display enhancer circuitry. It

even de-interlaces live external video' A must for any A2000 owner. Ask about our A2000 "genlock slot trade-up" program in case your genlock slot is theade used by somethi



is already used by something less exciting!)

Simultaneous Component Video (RGB) Out, Composite Video Out and S-VHS Video Out. Now, anything you can see on your Amiga monitor can be recorded on video tape, Introducing the IMPACT VISION 24<sup>™</sup> from GVP The All-In-One Video Peripheral for the A3000 and A2000

including animations, ray-traced 24-bit intages and more!

Picture-In-Picture (PIP) Display. Freeze, resize, rescale and/or reposition live facoming RGB video just like any workbench window at the double click of a monse or the pressing of a "hot key". With a multisync all this can even he in rock steady de-interfaced mode. Unique "reverse-PIP" feature, even allows you to place a fully functional Amiga workbench (or other application) screen as a SCALE-ABLE (shrunk down!) and re-positionable window over full-screen live video.

To make sure you can take full and immediate advantage of every feature of your new Impact Vision 24 video-station, we even include the following software with every unit:

- Caligari "4V24. An exclusive version of the leading broadcast quality, 3-D modelling and rendering program. Use your imagination to model 3D, 16 million color, scenes. Use your digitized video images as textures to wrap around any object' The mind is the limit!
- SCALA "-Titling. Easy-to-learn, video titling package complete with lots of special fonts and exciting special transition effects. Turn your Amiga into a character generator.
- MACROPAINT "HV24. A 2D, 16 million color paint program that lets you have fun



creating or manipulating any 16 million color, 24-bit image.

 Control Panel. Provides full software control over all Impact Vision-24's numerous features. Use your mouse or simply



press a configurable "hot key" to activate any feature.

At GVP, we wanted to make a major impact on the use of the A3000/2000 by professional video enthusiasts. With the Impact Vision-24 we have!

For more information on how the **Impact** Vision 24 can have a major impact on your video productions, call us at 215-337-8770.

with every unit: • Calgari "•NZ4. An exclusive version of the leading broadcast quality, 3-D modelling and rendering

GVP

GREAT VALLEY PRODUCTS, INC. 600 Clark Ave., King of Prussia, PA 19406 For more information or your nearest GVP dealer, call today. Dealer inquiries welcome. Tel. (215) 337-8770 • FAX (215) 337-9922

IIGA 3000

Are being an ender ender an ender e

## SAVE IT. MOVE IT. GET IT BACK.

Back-Up...Transfer...Retrieve Quickly And Easily With Central Coast's Software For The Amiga from: floppy disks, streaming tape (AmigaDOScompatible), Inner-Connection's Bernoulli drive, or ANY AmigaDOScompatible device

#### Mac-2-Dos & Dos-2-Dos – A Moving Experience

It's easy. Transfer MS-DOS and ATARI ST text and data files to-and-from AmigaDOS using the Amiga's own disk drive with Dos-2-Dos; and Macintosh files to-andfrom your Amiga with Mac-2-Dos' Conver-

sion options for Mac-2-Dos include ACSII, No Conversion, MacBinary, PostScript, and MacPaint to-andfrom IFF file format.

Requires external Macintosh druv

Valuable utility programs can save you time, money and, in the case of catastrophic errors like hard drive failure, possibly months of work.

#### Quarterback Tools – Recover Lost Files

Fast and easy. Reformats all types of disks – either new or old filing systems – new or old Workbench versions. Also optimizes the speed and reliability of both hard and floppy disks. Eliminates file fragmentation. Consolidates disk space. Finds and fixes corrupted directories.

#### Quarterback – The Fastest Way To Back-Up

Backing-up has never been easier. Or faster. Back-up to, or restore



A STREET

Set.

24-1534

MACEDOS

12

#### Central Coast Software A Division Of New Horizons Software, Inc.

206 Wild Basin Road, Suite 109, Austin, Texas 78746 (512) 328-6650 \* Fax (512) 328-1925

Quarterback Tools, Quarterback, Dos 2 Dos and Mas, 2-Dos are all trademarks of New Horizons Software. Inc.

Circle 104 on Reader Service card