THE ST QUARTERLY

START™

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Summer 1987 Volume 2, Number 1

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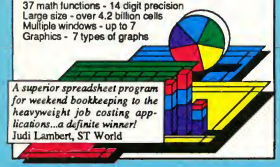

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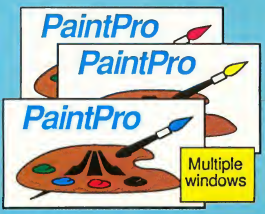

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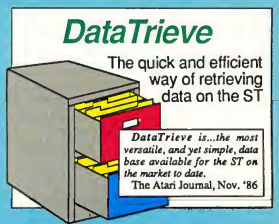

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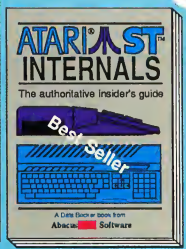

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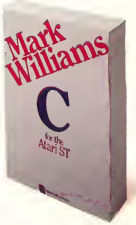

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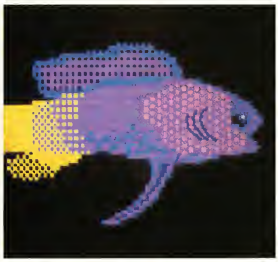

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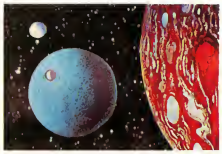

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EDITORIAL

Photography: Mary Rhomberg Lavery

Q. *What had over 1700 pages, over two million bytes of software by the finest ST writers (Tom Hudson, David Small, Dan Moore, Matt Loveless, Patrick Bass and others) and cost only $60.00?*

A. *A subscription to the first year of START, The ST Quarterly, which included Antic, the most successful Atari magazine of all time.*

It's hard to believe START's been around for a year. We've doubled in circulation since our first issue—from 25,000 to over 50,000 today, and still growing. From June 1986 to June 1987, we've endeavored to publish the best ST programs, tutorials, perspectives and software reviews. Your response assures us that we succeeded.

A computer magazine such as START is a lot like a call-in radio talk show—it works better with audience participation. If you had a complaint, a suggestion, constructive criticism, or, ahem, praise, then we took your comment and ran with it, tried to incorporate your input into our—*your*—magazine. At START we have our own ideas about what constitutes interesting, informative and useful editorial, but we can't operate in a vacuum. So, keep telling us what you want. More reviews? Programs in BASIC, not C? Perspectives? Hardware tutorials? Tell us what we're doing well, and tell us what we need to improve.

Okay, so what's coming up from START?

- A subscription for only $39.95 a year—that's $10 an issue, including a single-sided disk packed with so many programs we have to compress them just to get them to fit.
- A subscription to START with disk *and* Antic and its magazine-within-a-magazine, The ST Resource, for a mere $59.95.
- More reviews, overviews, and in-depth examinations of ST hardware and software, including the Mega STs, laser printers, and more!
- And, finally, an increase in publishing frequency. When we see the quantity of subscriptions go up (and you'll have to help us here) and an increased level of advertising that a professional magazine like START needs, then we'll be able to leave our quarterly status behind.

And don't forget our own electronic news service on CompuServe—Antic Online, headed by Charlie Jackson, which provides technical help, downloadable software and late-breaking news, such as our famous CES reports. Log onto CompuServe, type GO ANTIC and check it out!

It's going to be an exciting year, and with your support, we'll continue to lead the way.

Jon A. Bell, Editor
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DIALOG BOX

BLACK AND WHITE AND READ IN CANADA

Can you tell me how to get "reverse video" characters like the 800 series Atari computers have?

Jean Gay
Toronto, Ontario, Canada

Jean, there are at least two different ways to use inverse *video characters on your ST. First, if you're programming for the TOS environment, send the VT-52 ASCII codes [ESCAPE] "p" (that's the ESCAPE character and a lowercase "p") to the console to start printing in inverse video. To turn off inverse, send the codes [ESCAPE] "q" (ESCAPE and a lowercase "q"). If you're programming in GEM, you'll need to change the writing mode to reverse transparent, using the* **vswr_mode(handle, 4)** *call from the VDI Library.*

BLACK AND WHITE AND BLUE IN ICELAND

I just bought my 1040ST with a monochrome monitor, and was wondering if I should have purchased the color system. A lot of software only runs on the color system. Is there any way to convert my monochrome programs to color?

Thorarinn Jonsson
Varma, Iceland

Bad news, Thorarinn. Unless the program was originally designed to work with the monochrome system, it would be virtually impossible to make any color program run in monochrome. Your best bet would be to go ahead and buy a color monitor, and keep both monitors handy—you'll get the best of both worlds. That's what we do here at START. Most of our word processing is done on the monochrome screen, and we boot in color to see the latest Darrel Anderson or Tom Hudson creation.

ALERT BOX

TROUBLESHOOTING TWISTER

Last issue, START presented several hard and floppy disk utilities by Dave Small and Dan Moore. One of these was Twister, a program enabling you to add another 40K per side of your standard 3.5 inch ST disks. Atari has even decided to adopt the Twister format, starting with the new TOS ROMs that will be available soon.

Well, a bug crept into our Twister at the last minute. The code on our last START disk will place the same serial number on each disk when you format the disk in Twister format. This causes your ST operating system to get confused, and lose track of which disk has been inserted, if you change disks in the middle of an editing session. Shortly before our last issue went to press, we received a phone call from Dave Small describing how he had inadvertently used a "serial number" parameter of -1 in the **Protobt( )** call. Dave asked if we could simply replace the negative one with the value one million, which the documentation says should generate a new random serial number for each new disk. START Technical Editor Patrick Bass says, "When I opened the file and replaced the value, I should've double-checked to see if the value should be binary, decimal, octal, or hexadecimal."

START regrets any problems caused by this oversight. To correct it, change the value of 1000000L in the **Protobt( )** function to 0x1000000L (*hexadecimal* one million).

HEY, THERE'S SOMETHING MISSING

We'd like to apologize to any of our subscribers who received the last issue of START minus their program disk. Our printer accidentally mailed out a batch of newsstand copies of the magazine, which should've been disk versions. They assure us this won't happen again. However, if you're a subscriber and you receive a copy of START without disk, contact us and we'll get a replacement disk out to you as quickly as possible.

FACING THE MUSIC

Why did Atari market a MIDI capable machine with such a primitive sound chip? The competition uses a top-flight sound chip, the same one used in many synthesizers. Will Atari reconsider this decision and revise the sound chip in a later model? Is it feasible to consider having an authorized technician modify my unit with a better sound chip, such as Ensoniq?

Gerald Stevens
Birmingham, Alabama

Gerald, when Atari went about designing the ST series computer, they tried to use the most powerful, time-tested "off-the-shelf" chips wherever they could. In the case of the sound chip, it's been in use for nearly ten years, and is considered a rock-solid performer. However, there's another reason, over and above the reliability and speed of the sound chip, that prompted Atari to use it. It contains two "free" onboard input/output ports. These two I/O ports are not ▶

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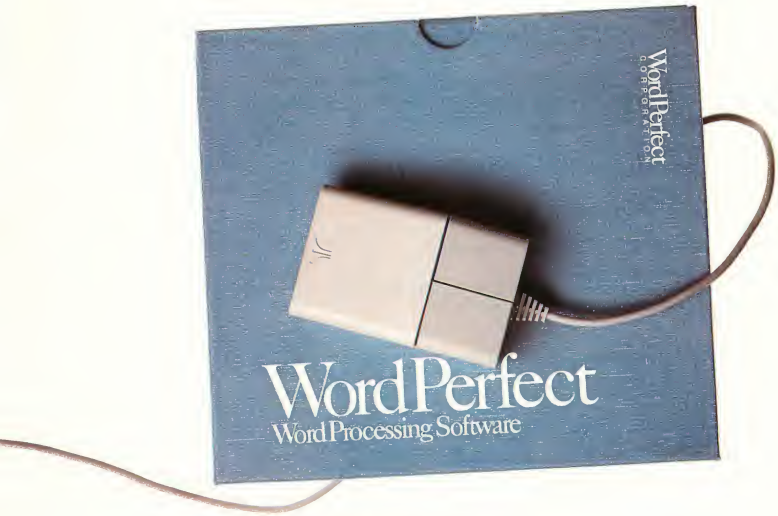

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logically connected to the sound-making capabilities of the sound chip, so Atari put them to use controlling the floppy disk interface and servicing the printer port. By doing this, Atari saved having to use another IC chip for I/O, and devoted the motherboard space for it to the MIDI interface.

Yes, the chip is awkward to use and could be considered primitive, but it's perfectly serviceable for program bongs, beeps, boops, whistles, and grunts, and if you actually need *to whip the chip, you can. Jez San, who wrote StarGlider, gets his AY-3-8910 to reproduce digitized speech and music. The G.I.S.T. utility in The Catalog renders the AY-3-8910 as programmable as almost any other sound chip. Besides, if you're* really *into music reproduction, you probably already have a Casio or Yamaha synthesizer to play your music for you.*

Some applications are even being released meaning they'll play the mood music for the application through your MIDI synth. Now some of that *sound is awesome.*

BLITTERABILITIES

I've read the 520ST is upgradable to one megabyte, and I was wondering if the 1040ST also had RAM upgrades available. Also, I've heard about something called a "blitter" chip. Could you explain what it is and what it does?

Pat O'Leary
Minneapolis, Minnesota

Pat, we have an article in the pipeline right now that describes upgrading the 520ST to have two megabytes of RAM, and the 1040 to hold four megabytes. However, it may be to your advantage to have a look-see at the Mega ST series of computers that Atari should be selling shortly after you read this. They already come equipped with either one, two, or four megabytes of RAM.

The blitter chip ("bit-block transfer graphics coprocessor") is an IC whose sole purpose in life is to move the contents of sections of memory hither and yon very quickly. As it stands now, the 68000 "brain" inside the ST has to perform the function of moving memory around, which includes pictures like the Desktop. The blitter chip will perform this function independently of the 68000—while the 68000's back is turned, as it were. The chip is ready to go, and you'll be able to install it inside your current 520 or 1040ST. You'll also need a new version of TOS-in-ROM, which will include blitter chip support subroutines. These subroutines (in another form) are already present inside the ST, but perform their function using a software approach, instead of hardware. The blitter chip will also be standard equipment inside the Mega ST computers.

PROBING FOR ADVENTURE

I recently bought the "QuestProbe" game from Adventure International, and when I tried to buy the "hint" book, found out the company has gone out of business. What do I do now?

William Payne
Folsom, California

William, you need to contact Shay Adams at:

QuestBusters
202 Elgin Ct.
Wayne, PA 19087 ■

WHERE'S MY DISK?

START is a magazine with programs on disk. Normally you will find the disk bound into the magazine and selling on the newstands for $14.95.

But some of you ST enthusiasts want to read START first, so we have provided a limited number of copies without disk for $4.00 each.

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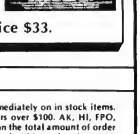

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Tom Bajoras graduated from Penn State as a chemical engineer in 1983; since then he's worked in a variety of situations, none of which have had much to do with chemical engineering. He's played keyboards in rock bands, recorded albums, composed film scores, and written many hours worth of serious music for various combinations of piano, orchestral ensembles, and electronic instruments. Tom first became interested in programming when he was in college, and the combination of Tom's musical and engineering experience provided him with the opportunity to launch a new career as a music software developer at Hybrid Arts, writing DX-Android, CZ-Android and the GenPatch Desk Accessory. Currently he's working on a music scoring program that will interface with the MidiTrack ST sequencer.

Contributing Editor **Tom Hudson** should be no stranger to the Atari community. He is the author of DEGAS, DEGAS Elite, and CAD-3D, versions 1.0 and 2.0. A START Contributing Editor, Tom has written four previous articles—"Stealing the ST Printer Driver" and "Swapping Art With Other Computers" in issues 1 and 2, and "Printer Drivers the Easy Way" and "The START Ray-Trace Construction Set," both in issue 4. Tom lives in Mission, Kansas, and is a SYSOP in the ATARI16 forum on CompuServe. When he's not programming, he relaxes by listening to Tangerine Dream and firing assault rifles. He also plays a killer game of racquetball.

Charles F. Johnson is a professional musician who has toured the world playing guitar with George Duke, Stanley Clarke, and Al Jarreau. He bought an Atari 400 back in 1980 after seeing a demo of the Star Raiders game, and ended up learning to program computers. Currently, he's trying to land a record deal with his own band in L.A., called Catzeye. When he's not working on musical projects he enjoys programming the ST in 68000 assembly language.

Jim Kent studied mathematics and art on and off at UC Santa Cruz for seven years before he decided to get rich in the computer graphics business. Since 1983 he's worked on Micro-Illustrator for the Tandy Color Computer, parts of several paint systems including Targa TIPS, and Aegis Images—and Aegis's Animator programs for the Amiga and ST. Jim's also the moderator of the Atari ST conference on BIX, where he can be reached online.

Ignac A. Kolenko Jr. is a second-year student at the University of Waterloo in Waterloo, Ontario, majoring in Computer Engineering. He has been programming personal computers for six years—first on a Timex/Sinclair, then on an Apple II, and for the last year on an ST. When he's not hitting the books, Ignac enjoys camping and bike riding—and, of course, astronomy.

Consulting Editor **Matt Loveless** has been writing and programming professionally since he was 14 years old. He became involved with Atari ▶

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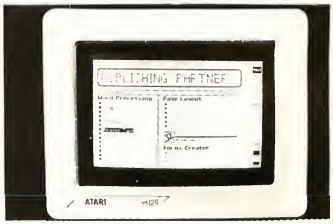

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computers when he developed a utility package, Page Six, for the original 400/800 8-bit machines. He was a game designer at Synapse Software for four years, and in 1986 became START's Assistant Editor. Matt has since gone freelance, acting as advisor for START magazine and tackling a number of lucrative programming and writing projects. His most recent accomplishments include the Mega ST User's Manual for Atari Corp. and work on the CyberMate experimental animation language, used with Tom Hudson's CAD-3D 2.0.

Daniel Matejka has been programming professionally, on and off, for over seven years. Four years ago he stumbled upon the crowd that makes and markets DB Master, a best-selling database on the Apple II which has been incarnated on several other machines as well. Dan was partially responsible for the IBM PC and Atari ST versions of that program. He lives in Colorado Springs, and is an independent software developer. He wrote Disk Doctor and Base Two, for Antic Software, and also Red Alert, a collaboration with Stanley Crane, one of the original DB Master programmers.

Jim Pierson-Perry is a research chemist for DuPont who leads a double life as a programmer and musician. He has worked with computers for 16 years and Ataris since 1982. His interest in music dates to early childhood when he was beaten over the head with a toy piano by his brother. Author of several programs published in *Antic*, Jim now lives in Elkton, Maryland, with his wife, four daughters, assorted cats and a dog. He is currently setting up a home MIDI-based music studio, writing software to support it, and occasionally manages to do enough clinical chemistry work to justify a paycheck.

David Plotkin, BASIC expert, has written countless programs, in both BASIC and Action!, for our sister magazine *Antic*. In past issues of *Antic*, he has authored a series of beginner's tutorials. An engineer at Chevron USA, David designs and builds oil processing plants and offshore platforms. David says he just bought another 520 ST for his wife, so they don't have to fight over the computer any more.

Jeff Wilson is a senior in Physics and Computer Science at Brigham Young University in Provo, Utah. He has been programming microcomputers for the past eight years, and Atari computers for the last six years. He is currently president of the Utah County Atari Nuts, his local Atari user's group. For the past three years, he has been employed by WordPerfect Corporation as a software engineer. While there, he participated in development of WordPerfect for the Apple IIe/IIc computer line. He is currently managing development of WordPerfect for the Atari ST, which should be available shortly after you read this. He programs exclusively in assembly language, and enjoys it! ■

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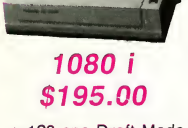

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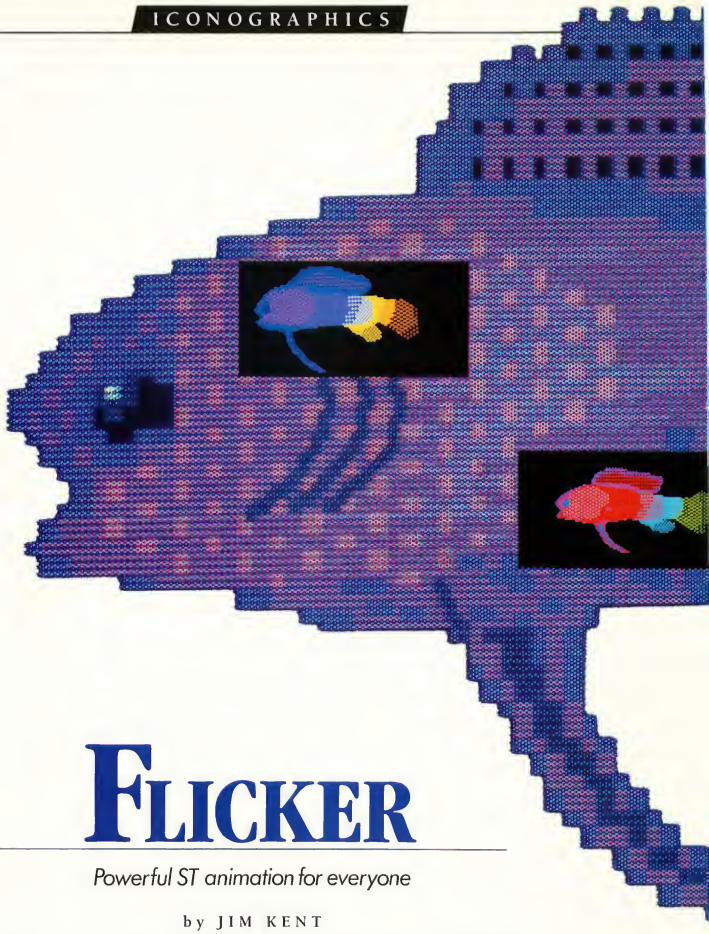

FLICKER

Powerful ST animation for everyone

by JIM KENT

Have you ever wanted to be a cartoon animator? It doesn't take years of time or millions of dollars to make a face smile or a fish swim; all it takes is an old-fashioned flip-book—or Flicker, a new program by the author of Aegis Animator ST. You'll find Flicker and a few sample animation files on your START disk!

File FLICKER.ARC on your START disk

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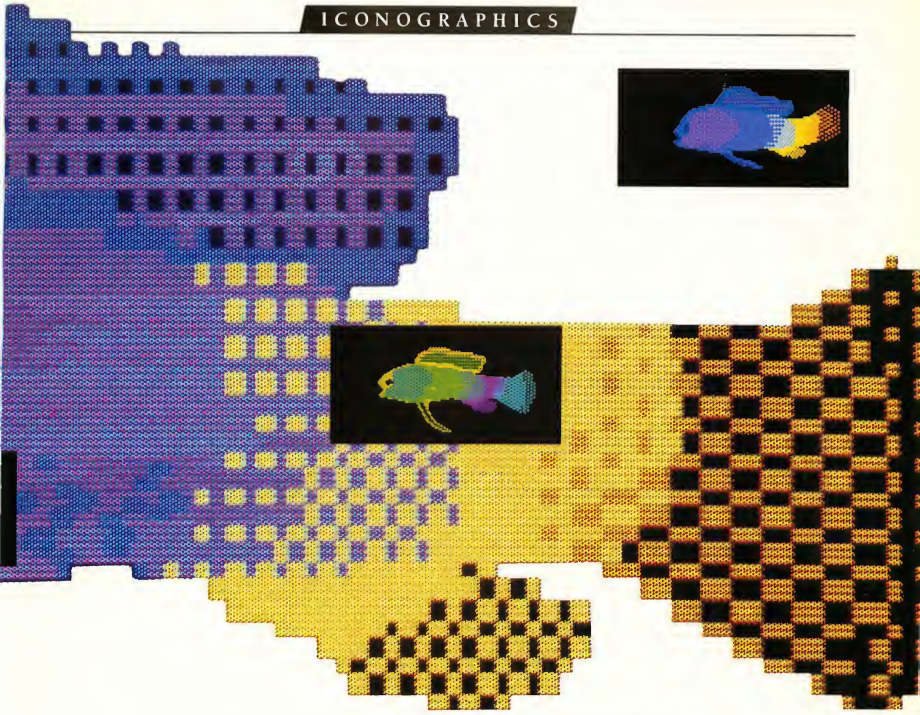

This Flicker animation sequence is on your START disk as GRAMMA.SEQ.

You've seen flip-books: little pads of stiff paper, each page with a drawing on it. You bend the book into an arc, one thumb over the page ends; then, sliding your thumb down, you let the pages flip past very quickly. Like frames in a movie, the flipping pictures give the appearance of motion.

You may have made your own flip-books as a bored schoolkid, drawing a dozen or so little faces or stick figures in the corner of your thick, boring history book, then sending them through their gyrations—a wink, a growing smile, a stick figure kicking up his/her/its legs. It's probably the easiest (and certainly the cheapest) form of animation to produce. With a flip-book you have to draw each frame entirely, but the impressions your pencil left from your previous frame can help to guide you.

Flip-books won't let you create a full-length *Fantasia*, but they are a lot of fun, and in my case, the germ of a new program. Inspired by the multiple work screens of DEGAS Elite, I decided to write my own flip-book animation program for the ST. I call it Flicker.

Flicker is basically a nifty little ST paint program. It has some drawing features I'm really proud of—the airbrush, a non-blinking cursor (easy on the eyes) and a really nice full-screen zoom. It also has lots of work screens, and, of course, the ability to cycle through them at various speeds. Flicker can read and save single-screen files from NEOchrome or DEGAS, and also save entire animation sequences. The program does have a limitation you should be aware of—it doesn't run on a monochrome ST. You'll see why when you run the program.

USING FLICKER

In the archive file FLICKER.ARC you'll find about 30 files. Most of them are source files. But to get started with the program, just copy the archive file to a disk with lots of free space, and un-ARC FLICKER.PRG. Change to low-resolution, then double-click on the FLICKER icon and in a few moments you should be greeted with a black screen with a white hollow-cross cursor on it. You can start drawing immediately ▶

Flicker...

FIGURE 1

FIGURE 2

FIGURE 3

by holding down the left mouse button as you move the mouse.

Flicker uses "pop-down" menus. These are much like normal ST drop-down menus except they are invisible until you hit the right mouse button, which toggles the menu bar on and off. I had a lot of technical problems using drop-downs, but worst of all, they make it hard for you to use the top part of your screen!

Try pressing the right mouse button down. The words "File Edit Draw Misc Frames Brush Color" should appear on the top of the screen. Move the mouse into one of the words and a menu should pop down. Try running the mouse from left to right across the top of the screen, and you'll see all of the options Flicker gives you. A picture of the Brush menu is in *Figure 1*. Most of the menu options have keyboard equivalents. I'll go through the menus an option at a time a little later, but first let's get started with a simple animation—a face winking. My version of a winking face is on disk as WINK.SEQ.

Pick a color you'd like from the Color menu, perhaps light blue. *Figure 2* has the first face I drew, one with both eyes open. As you draw you might want to get close up to some areas. Just hit the **z** for zoom, and a framing box will appear. Position it over the area you'd like to blow up, then click. *Figure 3* shows a zoom of my face's left eye. When you want to see the full screen just hit **z** again. Made a mistake? Hit the Undo key and the last line you drew will disappear. When you're done drawing, select Append from the Frames menu. Flicker will create a new frame that's an exact copy of the previous frame, and now you'll be drawing on the new frame. You'll see a message saying you're on frame 2 of 2 and how much memory you have available.

Now comes the fun part. From the Edit menu select Blue Pic. *Figure 4* shows what happens. All colors on the screen except black (color 0) changed to dark blue (color 1). Think of this color as non-reproducing blue—you can see it, but it will vanish in the final version. You can use this blue silhouette to guide you as you draw the next frame. (Remember the pencil impressions left in your history book?) Trace over the blue, making slight changes to create the second frame of your animation. Then flick back and forth between frames with the left and right arrow keys. When you're happy with the new frame, select Unblue Pic from the Edit menu and the blue will vanish into the background color. *Figures 5 and 6* show my second frame before and after "unblueing." You repeat this procedure—Append, Blue Pic, draw, Unblue Pic—until you have all the frames you'd like. For the final frame you might want to visit the first frame to make sure the picture doesn't jump too much when the animation loops around. You can use the up and down arrows to go to the first and last frames.

Flicker will let you make up to 128 frames if you have the memory—a Mega ST4, with four megabytes of RAM, would let you do it. On an unmodified 520, depending how many desk accessories you have, you'll probably get an "out of memory"

Inspired
by the multiple
work screens of DEGAS Elite,
I decided to write
my own flip-book animation
program for the ST.
I call it Flicker.

message if you make more than 8 frames; on a 1040 you should get over a dozen. Append will make a new frame immediately after whatever frame you're on, so you'll usually want to make sure you're on the last frame before appending. If you want to watch your animation play through, without getting manic on the arrow keys, go back to the Frames menu and select Play Forwards. This will go from one picture to the next in ten 1/60ths of a second (10 jiffies). You can also Play

FIGURE 4

FIGURE 5

FIGURE 6

Slowly at 20 jiffies per frame, or Play Fast at 4 jiffies per frame.

After you finish your computer graphics epic (**The Last Starfighter II**?), you'll probably want to save the animation you've made. To do this, select Save Seq from the Files menu. You'll get the standard GEM File Selector box. Type in the filename for your animation (don't forget the .SEQ extender) and press the Return key or click on OK. Before saving the file, Flicker checks to see if you have enough space on your disk. Flicker doesn't save the whole picture for each frame—just enough of it to hold the part that isn't the same color as the background. Still, .SEQ files still can get pretty large; I have one that's 150K! (If you spend much time doing computer animation, you'll probably find as I do that a good, cheap, fast hard disk is more important to an animation programmer than a blitter chip—but I'm not going to knock any neat hardware Atari decides to offer.)

Though Flicker is most fun for quick flip-book type doodles, it is actually a fairly powerful paint system as well. While DEGAS Elite is definitely your choice if you have to do a lot of text in a variety of fonts, and NEOchrome has more different shapes, you might find as I do that Flicker is the best for drawing things by hand. You can see the time I spent on the frames shown on pages 16-17. (This animation's on your START disk as GRAMMA.SEQ). The combination of the full screen zoom, being able to pick up a color under the cursor, and not having the cursor blink at you all the time really makes Flicker great for doing detail work. The airbrush really sprays! Not just a little drizzle, but with enough guts to make you feel like decorating a couple of subway cars with graffiti. Try spray with one of the bigger brushes for real pixel demolition.

I dislike having to change from medium-resolution (where I do most of my text editing and programming) to low-resolution to run graphics applications in 16 colors. Unfortunately GEM is pretty silly about adapting to new resolutions unless you go through the "Set Options" dialog on the desktop. Ninety percent of Flicker's functions will work if you start it from medium resolution—enough to replay animations and use most drawing functions. However the flood fills and polygon fills will only work for the first three colors.

FLICKER A FUNCTION AT A TIME

Flicker has many more features than you saw in that brief walk-through, including cut-and-paste, some pre-defined shapes, and area fill.

There are 44 functions you can choose from the pop-down menus, and you can select from among 16 brushes and 16 colors. One way to explore them is by just playing with the program—you can learn a lot simply through experimenting on your own. But here's a complete list of Flicker's functions, divided into separate sections for each of the pop-downs. Where keyboard equivalents exist, they are noted in parentheses immediately after the function name.

File

- About Flicker—displays copyright notice.
- Load Pic—loads a DEGAS (.PI1) or NEOchrome (.NEO) file into current frame (DEGAS usually, NEO if you've selected NEO under Misc).
- Save Pic—saves a NEO or DEGAS file from current frame.
- Load Cel—loads a DEGAS .CEL file into the clip buffer. The cel will appear momentarily on the screen after it's loaded, but to use it in your animation you must select Paste under the Edit menu.
- Save Cel—saves the clip buffer to a .CEL file. Clip or Cut out a piece of a picture from the Edit menu first.
- Load Seq—loads an entire Flicker sequence. Careful with this one, because there's no undo!
- Save Seq—saves all frames to a .SEQ file. Checks disk free space first (this can take a while on a hard disk).
- Load Col—loads color map from a .COL file (a simple 16 word file).
- Save Col—saves color map.

Edit

- Undo—(or Undo key) forgets last thing you did to this frame. ▶

Flicker...

- Blue Pic–(or (key) turns everything that's not the background color (color 0) to "non-repro-blue" color (color 1).
- Unblue Pic–( ) key) removes non-repro-blue color.
- Clear Pic–(or Backspace key) turns this frame to background color.
- Clear Seq–deletes all frames. Watch it–this one also doesn't undo!
- Cut–(F1) cuts out a portion of the screen into clip buffer for later pasting or to save as a .CEL file. Your cursor will become a full-screen cross until you pick the one corner of the box to save. Hold the left button down and drag it to the opposite corner and release. Hit the right mouse button if you decide not to cut out anything.
- Clip–(F2) clips all non-zero portions of the picture into the clip buffer. That is, the ST will find the smallest box that has anything drawn in it.
- Paste–(F3) puts a copy of the clip buffer onto the screen. Hit the right mouse button to leave it exactly in the position you clipped it from, or drag it to a new place with the left mouse button.
- Fit Colors–(F4) If the .CEL has a different color set than the picture you're in, this will adjust the colors of the cel to the closest colors it can find in the picture's color set.

Draw

- Draw–plots a dot or brushes down as long as you hold down the left mouse button.
- Drizzle–a slow, relatively small airbrush.
- Spray–a big fast airbrush. Works with brushes, too–very quick!
- Flood–fills an area with a color.
- Line–draws one straight line. Push the left button down at the point you want to begin the line, hold it down as you move to the other end, then release it.
- Lines–draws connected straight lines. Click the left button at the endpoint of each line. Press the right button to end.
- Polygon–draws a free-form polygon. Click left button over each corner, right button to end. This will be hollow or filled depending on the Filled selection under Misc.
- Rays–draws rays radiating from a single point. Click the left button over the center, then move the mouse to where you want the first ray to appear. Click the left button again for each individual ray, or hold the left button down and whoosh around the center to create a series of rays quickly. Click the right button to end.
- Circle–Push the left button down over your centerpoint and drag out a circle to the desired radius. A circle can be either hollow or filled. If it's hollow it will be drawn with the current brush.
- Box–creates a rectangle. Hold the left mouse button down where you want a corner of the box to be, then drag to the box's opposite corner and release. A box can be either hollow or filled.

Miscellaneous

- Status–(space bar) displays which frame you're on, how many frames you've created, how much memory is left, and how much you started with.
- Zero Clear– determines whether the background color of a cel is treated as transparent when a section is cut and pasted (default is transparent).
- Filled–determines whether polygons, circles and boxes are hollow or filled (default is filled).
- NEOchrome–determines whether pictures files are DEGAS (the default) or NEOchrome format.
- Zoom–(z) toggles zoom on and off. When you turn it on, a white frame will appear around the cursor. Move the frame to the area you want to magnify and press the left button. Flicker's zoom can only move horizontally in 16-pixel jumps.

Frames

- Go Forward–(right arrow) moves to next frame in sequence.
- Go Backward–(left arrow) moves to previous frame.
- Go to Last–(down arrow) moves to final frame in sequence. Usually you'll do this before appending a new frame.
- Go to First–(up arrow) moves to the start of the sequence.
- Append–(Clr/Home key) creates a new frame after this frame. It starts out as an exact copy of this one.
- Insert–(Insert) creates a new frame before this one.
- Delete–(Delete) removes this frame. Screen jumps to next one.
- Play Forward–(F10) flips through screens at normal speed–6 frames per second.
- Play Backward–(F9) flips through screens backward at 6 frames/sec.
- Play Slowly–(F8) flips forward at 3 frames/sec.
- Play Fast–(F7) flips forward at 15 frames/sec.

Brush lets you select one of 16 brushes. The hollow cross brush on the upper left actually draws a single point.

Color lets you select one of 16 colors. You can select the color under the cursor by hitting the c key.

THE NITTY GRITTY

If I gave an exhaustive explanation of how this program works it would probably fill up this entire issue of START, and it would take me longer to describe Flicker than it did to write it

in the first place! However, the source code is on your START disk in the file FLICKER.ARC for you to look at. To examine the source files, un-ARC them, following the instructions on the Disk Instructions page in this issue of START.

The program is roughly one-third assembler and two-thirds C. The text editor, assembler, compiler, linker, and make utility are all from Manx Software's Aztec C package. Aztec C is the developer's choice on the Amiga. By doing some work for Manx I was able to get an alpha version to work with on the ST. Since it's not released yet, all I can say is I hope the rest of you get to link this fast soon!

The airbrush really sprays! Not just a little drizzle, but with enough guts to make you feel like decorating a couple of subway cars with graffiti.

Most of the drawing and page-flipping routines are written in assembler, and most of that code is pretty boring. This is because to get any speed out of the ST you must have a separate drawing routine for each color. With the "interleave-bit-plane" organization of the ST, routines that draw only one color run two to three times as fast as routines handling any color. In the assembler source you'll find 16 dot-plotting routines and 16 ways to draw a brush. (Someday, I hope we'll have access to a byte-a-pixel graphics engine.)

Also of potential interest to graphics speed-freaks is the zoom routine, which can blow up an area by a factor of 4 onto a full screen in 1/26th of a second. It uses some table lookups and a lot of in-line code. There's another big table-lookup in the airbrush code, which does a conversion from polar to Cartesian coordinates with one lookup, two swaps and two multiplies.

Another reason the airbrush, cursor and draw routines can go fairly quickly is that I keep 16 copies of the current brush, each shifted over a pixel, so the poor 68000 doesn't have to shift during draw time. With a blitter chip, I wouldn't need to do this.

There's a circle-drawing routine in CIRCLE.ASM, and its filled version in DISK.ASM. Take a look at them. You might be surprised to find that incremental circle algorithms can be just as simple, and potentially faster, than incremental lines.

Finally there's the beam-skipping: In the file CLOCK.ASM you'll find not only a way to access the 200Hz system timer, but also ways to see where on the screen the video beam is. That way you can avoid drawing on the parts of the screen that the beam is updating. It's this code that prevents the cursor from flickering.

The C code, which handles most of the decision making and user interface, is a bit more convoluted. The main routine is in the file MAIN.C. This consists of little more than system initialization and a forever loop—**for (;;)**—checking to see if there's a key to interpret or if a mouse button is pressed.

If the right mouse button is pressed, **main( )** calls the pop-down interpreter in PULL.C. The data for the pop-downs is in CELPULL.C. If the left mouse button is pressed, control jumps through a function pointer **(pentool)** to some routine depending on what's selected from the Draw menu. Most of these routines are in PENTOOLS.C.

The pen tools themselves, as well as most of the other functions, are complicated greatly by doing **hide_mouse( )** calls before any drawing begins, and **show_mouse( )** calls when drawing is done. Further, making sure the screen gets updated in "zoom" mode leads to lots of little function calls. I haven't found a really elegant way to design this that would still be fast; I just beat on it until I got it right.

If you're interested in a fairly clean-looking piece of code that may be useful to you, take a peek at PULL.C. There are still some zoom-buffer complications, but with any luck you'll figure out how to yank them out and have nice, responsive, unobtrusive pop-downs for your own application. (Be forewarned: the one disadvantage to pop-downs is that they lock out desk accessories.) **Pull( )** takes a simple tree data-structure. Rather than having a million flags to decide how to draw something (like GEM does), **pull( )** has a slot for a drawing function. If you need something other than text, a brush, or a box, you can just write your own function and stick it here. The code calls the function in the structure with the structure itself. This very powerful programming technique is how object-oriented programming languages such as Smalltalk and C++ implement "methods".

Don't be afraid to dig into the code and experiment with it. If you have any questions, I can be reached on BIX, where I'm the Atari ST moderator. In the meantime, happy flicking, and maybe happy tweening too! ■

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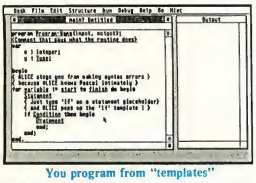

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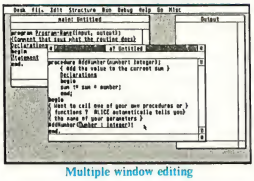

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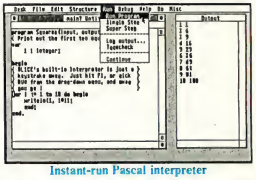

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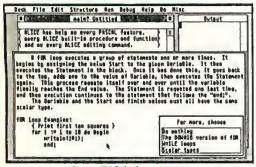

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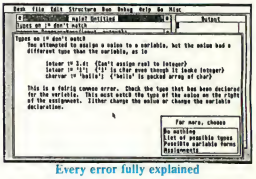

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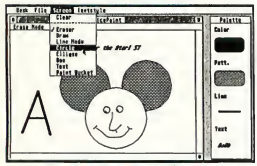

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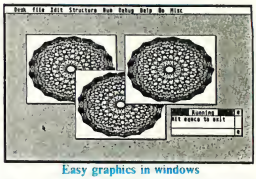

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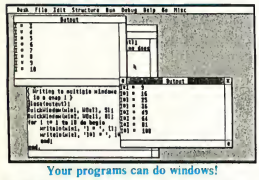

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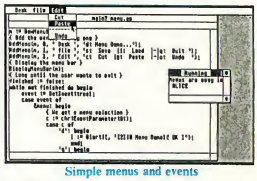

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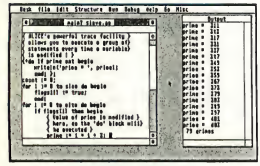

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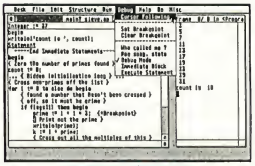

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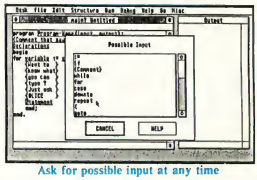

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CIRCLE 027 ON READER SERVICE CARD

A Super Toolkit For DEGAS Elite

Exploring the built-in desk accessory hooks

by PATRICK BASS
START TECHNICAL EDITOR

Up to now, communication with DEGAS Elite has been limited to keystrokes, mouseclicks, and occasional moans of frustration. Continuing in a series of articles dealing with upgrading DEGAS Elite, Patrick Bass shows you how to construct your own desk accessories which capitalize on the built-in GEM message pipe to add your own features to this powerful drawing program.

DEGAS Elite is a program that could sell the ST series computer all by itself. It's one of the most powerful art programs available for any 16-bit computer. But, inevitably, after many hours of using it you'll find yourself saying, "Gee, if I could just. . .?", or "Golly, why can't it. . .?", or similar groans.

How would you like to be able to command DEGAS Elite to perform your own functions? Have you come up with something you need DEGAS Elite to do that it can't do now?

In "Plumbing In GEM" in this issue of START, Tom Hudson describes a communications channel he has built into DEGAS Elite, which allows your GEM Desk Accessories access into the very heart of DEGAS. ▶

File TOOLKIT.ARC on your START disk

Toolkit...

The Page Flipper lets you perform simple eight-frame animation from within DEGAS Elite.

With this "pipeline," you may now create programs that access Elite's picture buffers, allowing you to apply your own favorite picture manipulation routines.

But just exactly *how* do you go about telling DEGAS Elite what to do? Nothing is better than an example, unless it's two examples, so that's what I've provided for you in this issue. First, we'll create the Page Flipper, which will allow easy page-flip animation from the DEGAS Elite main menu screen. Second, we'll build the Screen Operator, which will allow you to play "what if" with the many different writing modes the ST allows, or let you "add" or "subtract" one picture from another. Let's discuss them both in general first, before we get into the nitty-gritty of how and why they work. (Editor's note: *For another program that allows you to do ST animation, see "Flicker" by Jim Kent, author of the Aegis Animator, in this issue of START.*)

FLIPPING OUT

There are basically two different ways to perform animation on a computer screen. One way is to erase the screen, then draw the first image onscreen, erase it, draw the second image, and so on ad infinitum. Done quickly enough, this may look perfectly acceptable, but if you don't increase the writing speed to the screen, as the image size grows larger it takes an increasingly longer and longer time to draw each image, until at some point the drawing process becomes visible to the observer. From that point on, the "animation" will appear to strobe, and lose its credibility as an animation system.

Another way is to draw every picture beforehand, and then flip through them at a fast clip. DEGAS Elite allows us to hold up to eight complete pictures, or workscreens, on a megabyte ST system, which is just enough for us to get smooth, cyclic motion. For example, you could draw a wheel, eight times, each time with the wheel rotated another 45 degrees. When you flip through these pictures quickly enough, the wheel appears to spin.

GRAPHICAL OPERATIONS– THE SCREEN OPERATOR

The ST computers allow about 16 built-in drawing logic operations. In other words, when you are moving bit-images around (or drawing lines, or whatever) you may specify a logical operation to be performed between what you're moving and where you're moving it to. By "logical operation" I mean the ability to apply the logic operators NOT, AND, OR, Exclusive-OR, or any combination of those, to bit-images you are moving. The old edit-compile-crash cycle gets in the way of playing "what if?" when experimenting with this effect, so this accessory will allow you to perform logical operations between entire screens, or between a source and mask, with a separate destination. Notice this will allow you to physically add or subtract one picture from another. It's actually quite simple. You can now OR one picture into another, or create entirely electronic matte shots for computer animation.

CREATION AND INSTALLATION

All the files you'll need are contained inside the file TOOLKIT.ARC on your START Disk. Copy TOOLKIT.ARC and ARCX.TTP over to a clean, fresh disk. Double-click on ARCX.TTP, and in the resulting "Open Applications" box type TOOLKIT.ARC and press the Return key. ARCX.TTP will reconstruct and uncompress all the available files from the original TOOLKIT.ARC file.

When ARCX is finished, you should find two reconstructed Accessories, their Resource Files and all source code written to your disk. Find, and copy, the four files PAGEFLIP.ACC, PAGEFLIP.RSC, OPERATOR.ACC, and OPERATOR.RSC over to a disk you will be booting from later. Insert this disk into your first disk drive, turn your ST computer off, count to fifteen (slowly), and then turn it back on.

Your ST will recognize and load the two Accessories PAGEFLIP and OPERATOR when it powers up. When your desktop appears, insert your DEGAS Elite disk and double-click on DEGAS Elite. Yes, it is possible to select the two Desk Accessories before DEGAS Elite is activated, but if you do they will simply scold you for trying to use them without DEGAS Elite being active. When DEGAS Elite powers up, the two Accessories are now available. Go up to the DESK menu item and check the drop-down menu. The two should be labeled there as "Page Flipper" and "Screen Operator."

FLIPPING THE FLIPPER

Let's explore the Page Flipper first. Before you activate it, draw eight simple frames of animation in DEGAS Elite. For my ini-

Photography: Mary Rhomberg Lowery

tial tests, I simply numbered each of the display screens. Now go up and click on "Page Flipper" from the DESK menu selection. You'll see a single Dialog Box pop up in the center of the screen. Refer to *Figure 1* during the rest of the description of the Page Flipper Dialog Box.

Along the top you'll see the title. Below that, stretching full width across the Dialog is the Sequence Window, showing which frames you've selected, and in which order they will show. You have room for up to 44 frames in a sequence. Directly below the Sequence Window are eight buttons you use to select which frame to show. For example, when you press the [2] button, a "2" is inserted into the Sequence window at the first available space. If you have fewer than eight screens available, only the buttons corresponding to available screens will be active. Below the Frame selection buttons are two buttons to allow simple editing of the Frame Sequence. The [CLEAR] button erases the current frame sequence, and the [BACKSPACE] button erases the last entry in the frame sequence. Underneath the two editing buttons is the Frame Speed control slider, which allows you to control how long each individual frame is shown onscreen. Slide the control left or right, or click-hold on either slider "thumb" to increase or decrease display time. The resultant computed display time will be shown inside the track of the slider. Finally, below the slider are two buttons. The [PERFORM] button will actually perform the Page-Flipping animation routines, with the [EXIT] button dropping you back onto the DEGAS Elite desktop.

Another way to do animation is to draw every picture beforehand, and then flip through them at a fast clip.

OPERATING THE OPERATOR

The Screen Operator is shown in *Figure 2*. As with the Flipper, the program title is along the top. Below the title box you'll find three screen selection boxes, each showing a single number with a "decrease" and "increase" thumb on either side. The left box shows the current selection for the SOURCE screen, the middle box shows the MASK screen selection, and the box on the right shows the current DESTINATION screen selection. Click on the Up arrow to increase these numbers, and click on the Down arrow to decrease them.

Below the screen selection boxes is a large box showing the logical operations you can perform. It's easy to follow the sequence of operations available. You may choose to NOT the source screen if you desire, then AND, OR, or EOR the screen against the DESTINATION, or against the MASK screen if you have the [With MASK] button selected. Finally, you may choose to NOT the destination screen before you set the result down. Right below the Operations Box there are three buttons, [EXIT], [VIEW] and [PERFORM]. [PERFORM] will actually do the operations between screens you've selected above. You'll see it perform right on the screen, but it goes fast, so if you miss it, and still want to see the results, point at the [VIEW] button, then press and hold the left mouse button for as long as you wish to view the results. The [EXIT] button will drop you back to the DEGAS Elite desktop.

THE BELLY OF THE BEAST

If you just want to use the Toolkit Accessories, and don't really care about how they're put together, you can skip the balance of this article. The rest of you, however, may read on.

Again, let's start with the Page Flipper. You'll need to refer to the program on your START disk called PAGEFLIPC . The very top of the file has a block of comments showing the author's name and copyright information. Below that are **#include**s for five standard header files and one unique file, **pageflip.h**, which was generated by the Resource Construction Set when the resource file was created.

Next, find a block of **#define** statements, to allow modification of the supporting language and the definition of ▶

Toolkit...

Using the Screen Operator you can overlay one picture on another.

constant values and constructions into meaningful names. In the variable definitions area, you'll first come across the only externally defined value you'll need to reference, called **gl_apid**, which stands for "global application ID," and represents the application's identification number. For integers, save space for box sizes, activity flags, and our message buffer.

There is only one warning string and space for the sequence buffer in the byte-sized declarations. Save space for three **longs**, including a single array of 15 longs to hold the screen pointers, and keep space for two floating point arrays, needed for the slider calculations. Oh, keep a single pointer to an OBJECT type, too.

A CODE IN THE NODE

In the **main( )** function, first initialize the application, get the handle of the accessory from **graf_handle( )**, and then register our accessory inside the **menu_register( )** call. It returns to us the number of our accessory, and stores the result inside the variable called **menu_id**. Next, it tries to load the resource file for the page flipper. If for some reason it can't, it warns you of impending danger.

Otherwise, it loads the resource successfully, and finds out where it wound up in memory with the **rsrc_gaddr( )** call, on the next line down. The address of the root of the object tree will be returned, and the program places it inside the variable **dialog0**. Since it's now gotten the resource file and is holding it in memory, it can find out how big some of the objects inside it are. It does that in the next block of code down, using **objc_offset( )** to find the location and size of three windows you'll eventually need to redraw without disturbing anything else inside the resource. Then it erases the current queue for holding the frame sequence to show, and places a single default frame, number one, into the buffer.

ACCESSORIES NEVER QUIT

Here's where the main block of code is. Notice there is no exit from the next loop. Why? Accessories never finish (rather they're not supposed to), so they can have no exit. Anyway, here it just needs to do two things—one, wait for a message which says you have selected the accessory to operate, and two, wait for a message coming from DEGAS Elite which returns where the screens actually are.

The program waits for messages inside an **evnt_multi( )** call. When one is received, it goes into **msgbuff[1]**, and falls down to the next available test, which decides if the message it received was from the screen manager telling it you have asked the accessory be opened. If not, it then tests if the message received was from DEGAS Elite telling it where everything is. If *that* wasn't the message, it disregards it.

If the message was from the screen manager, asking the accessory to open, it makes one further check to see if the message really is for the accessory, by comparing the menu ID number it received earlier. If they match, then open the virtual workstation, and then call the function **inquire( )**, which will send a message to DEGAS Elite asking it to send the location where DEGAS Elite keeps its screen pointers. When it returns from that call, close the workstation, and fall back into the **multi** call, waiting for the answer from DEGAS Elite.

When DEGAS Elite responds to our request, it will send the accessory a message. The accessory will detect that message, open the workstation again, pick up the current horizontal and vertical resolution, and then call the function **menu_handle( )**, which performs the main body of work here. When it finally does finish the work, it will return to this point when you click on the [EXIT] button located right on the dialog box.

INQUIRING MINDS WANT TO KNOW

The next function, **inquire( )**, gets called when the accessory first opens up. It first decides if DEGAS Elite is even available, by testing for its application number. If the number can't be found, it will scold the user and drop out. If the number is found, **inquire( )** will send a message to DEGAS Elite with the **appl_write( )** call, sending it a string of sixteen characters containing the DEGAS00 instruction, asking for the pointer to the screen pointers.

A HANDLE ON THE SITUATION

The function here that performs the major body of work is called **menu_handle( )**, which starts by dynamically determining the corners of a small centered box onscreen. Next, using the information returned to us from DEGAS Elite, we determine exactly where in memory the master pointer to the

list of screen pointers is that DEGAS Elite keeps. We place the address of the master pointer inside the variable **s_ptrs**. Using that information, we then access and retrieve each available pointer and place them inside the long array **screen**[].

Next, execute **wind_update(TRUE)**, as we're about to start writing to the screen. The two **form_dial()** calls will reserve space for the dialog box and grow the expanding rectangle onscreen. Next, determine the condition of the graphic buttons inside the dialog box, and set them accordingly. Finally, draw the dialog box onscreen with the **objc_draw()** call, passing in the address of the root of the object tree, the maximum level of children to draw, and the box's clipping rectangle.

Before you actually interact with the dialog, you'll need to tidy up the displayed numbers and strings inside the box. The program will then encounter the DO loop, which takes on the task of interacting with the dialog box itself. Start by calling the **form_do()** function, which will handle button presses and so forth in the dialog box, and then return the number of the object which caused the exit from the dialog box. Put this number inside the variable **key1**.

Next, perform three tests. If the exit button pressed was BPERFORM, which is the [Perform] button inside the dialog box, perform the function **flip_it()**, and then reset the state of the [Perform] button. If the exit button was one of the sequence buttons, or one of the sequence editing buttons, drop through to the function **filter_key()**, which will perform any action requested by that particular key. If the exit button pressed was a key coupled with the slider function, then perform the function **do_slider()**. Continue in the DO loop for as long as the user doesn't press the BEXIT (the onscreen [EXIT]) button.

When the user really does wish to exit, redraw the dialog box without any selected buttons, drop through the two last **form_dial()** function calls to release the memory for the resources and draw the shrinking box outline, then reenable GEM drawing of the screen with **wind_update(FALSE)**, and return to the main **multi** loop.

THE STATE OF THE BUTTONS

The first section here will figure out how large sections of the dialog are, so the program may build a set of clipping rectangles for when it will need to update and redraw these objects. The second section sets the initial state of the sequence selection buttons, showing whether or not the screens they represent are actually available from DEGAS Elite. If the associated screens are available, then the buttons are drawn as SHADOWED; if not, they're drawn as DISABLED.

Next, in **flip_it()**, decide first if there are any frames to flip through. If there are, then point to each one in turn and display it onscreen. Once the frame is displayed, delay for the length of time the user has selected with the speed slider, synching to the vertical blank interrupt to get even timing. Continue to do this as long as the user hasn't pressed the buttons on the mouse. When a button is pressed, drop out of the display loop. Towards the bottom, if there are no frames to display, then ask the user to place at least one single frame in the sequence buffer.

The next function down, **filter_key()**, receives the keystroke pressed inside the dialog box and decides what to do with it. For example, if the key pressed was the B8 key (which corresponds to the [8] key onscreen,) the proper routine inserts the character "8" into the frame sequence, and then displays it onscreen.

The next two functions are related. The first, **adjust()**, takes as parameters the address of the dialog box, the number of the object holding the string to change, the address of the new string to use, and the corners of the clipping rectangle for that particular object. The second, **set_text()**, actually performs the work of inserting the address of the new string inside the object tree.

The ST computers allow about 16 built-in drawing logic operations.

UTILITIES

To aid in moving strings around, two functions, **strcat()**, and **strlen()**, are provided to allow concatenation of strings and the finding of the length thereof. The next function, **reset()**, provides the initial settings for the horizontal slider which controls display speed, while the one below, **do_slider()**, performs the proper work when you press the slider "thumbs" or click-drag the slider button.

DOWSING THE OPERATOR

Now we get into the Screen Operator. Print out and refer to the program OPERATOR.C on your START disk. The top of the file has a block of comments showing who wrote the program and copyright information. Below that it **#include**s five standard header files and one unique file, **operator.h**, which was generated by the RSC when the resource file was created.

Next, find a block of **#define** statements, to allow modification of the supporting language and the definition of ▶

Toolkit...

constant values and constructions into meaningful names. In the variable definitions area, you'll first come across the only externally defined value you'll need to reference, called **gl_apid**, which stands for "global application ID", and represents the application number. For integers, save space for box sizes, activity flags, and our message buffer.

We hold only one warning string and space for the sequence buffer in the byte-sized declarations. We save space for three **longs**, including a single array of 15 longs to hold the screen pointers, and we keep space for a single pointer to an OBJECT type.

THE MAIN SECTION

In the **main( )** function, we first initialize the application, get the handle of our accessory from **graf_handle( )**, and then register the accessory inside the **menu_register( )** call. It returns the number of the accessory, and will store the result inside the variable called **menu_id**. Next, try to load the resource file for the screen operator. If for some reason it can't, then warn the user of impending danger.

Otherwise, load the resource, and find out where it wound up in memory with the **rsrc_gaddr( )** call, on the next line down. The address of the root of the object tree will be returned, and you'll need to place it inside the variable **dialog0**. Next, make sure all the button flags are turned off, and select the default settings for the source, mask, and destination pictures. Show the mouse, and then fall into the **evnt_multi( )** loop.

THERE'S NO WAY OUT

Here's where all the work is done. Notice there is no exit from the next loop. Why? Accessories never "finish", so they can have no exit. Anyway, here it just needs to do two things. One, wait for a message telling it you've selected the accessory to operate, and two, wait for a message coming from DEGAS Elite telling it where the screens are.

The accessory will wait for messages inside an **evnt_multi( )** call. When one is received, it goes into **msgbuff[ ]**, and it will fall down to the next available test, which decides if the message received was from the screen manager asking the accessory be opened. If not, test if the message received was from DEGAS Elite saying where everything is. If that wasn't the message, disregard it.

If the message was from the screen manager, asking the accessory to open, then make one further check to see if the message really is for the accessory, by comparing the menu ID number it received earlier. If they match, then open our virtual workstation, and then call the function **inquire( )**, which will send a message to DEGAS Elite asking it to send the location where DEGAS Elite keeps its screen pointers. When the accessory returns from that call, close the workstation, and fall back into the **multi** call, waiting for the answer from

FIGURE 1

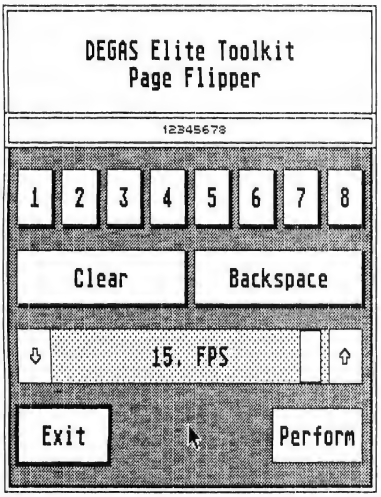
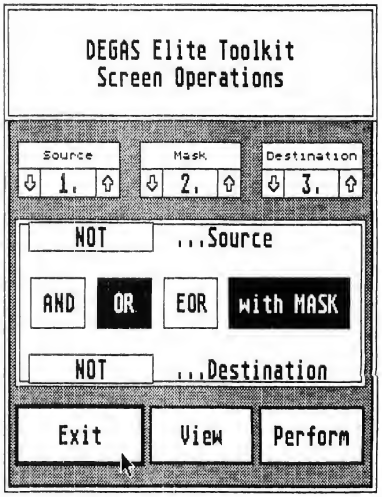


FIGURE 2



DEGAS Elite.

When DEGAS Elite responds to the request, it will send the accessory a message. The accessory will detect that message, open the workstation again, pick up the current horizontal and vertical resolution, and then call the function **menu_handle( )**, which performs the main body of work here. When the accessory finally does finish the work, it will return to this point when you click on the [EXIT] button located inside the dialog box.

JUST ASK DEGAS, HE KNOWS EVERYTHING

The next function, **inquire( )**, gets called when the accessory first opens up. It first decides if DEGAS Elite is even available, by testing for its application number. If the number can't be found, scold the user and drop out. If the number is found, send a message to DEGAS Elite with the **appl_write( )** call, sending it a string of 16 characters containing the DEGAS00 instruction, asking for the pointer to the screen pointers.

The function here which performs the major body of work is called **menu_handle( )**, which starts by dynamically determining the corners of a small centered box onscreen. Next, using the information returned to us from DEGAS Elite, we determine exactly where in memory the master pointer to the list of screen pointers is that DEGAS Elite keeps. We place the address of the master pointer inside the variable **s_ptrs**. Using that information, access and retrieve each available pointer and place them inside the long array **screen[]**.

Next, execute **wind_update(TRUE)**, as you're about to start writing to the screen. The two **form_dial( )** calls will reserve space for the dialog box and grow the expanding rectangle onscreen. Next, determine the condition of the graphic buttons inside the dialog box, and set them accordingly. Finally, draw the dialog box onscreen with the **objc_draw( )** call, passing in the address of the root of the object tree we wish drawn, the maximum level of children to draw, and the box's clipping rectangle.

Before the user actually interacts with the dialog, you'll need to tidy up the displayed numbers and strings inside the box. Next comes the DO loop, which takes on the task of interacting with the dialog box itself. Start by calling the **form_do( )** function, which will handle button presses and so forth in the dialog box, and then return the number of the object which caused the exit from the dialog box. Put this number inside the variable **key1**.

Next, perform three tests. If the exit button pressed was BPERFORM, which is the [Perform] button inside the dialog box, perform the function **operate( )**, and then reset the state of the [Perform] button. If the exit button was one of the operation buttons, drop through to the function **filter_key( )**, which will perform any action requested by that particular key. Continue in the DO loop for as long as you don't press the BEXIT (the onscreen [EXIT]) button.

When you really do wish to exit, drop through to the two last **form_dial( )** function calls to release the memory for the resources, and draw the shrinking box outline, then reenable GEM drawing of the screen with **wind_update(FALSE)**, and then return to the main **multi** loop.

BUTTON INITIALIZATION

The first section here will figure out how large sections of the dialog are, so it may build a set of clipping rectangles for when it needs to update and redraw these objects. The second section sets the initial state of the operation selection buttons, showing whether or not the buttons they represent are active. If the buttons are active, they're drawn SELECTED, if not, they're drawn NORMAL.

The next function down, **filter_key( )**, receives the keystroke pressed inside the dialog box and decides what to do with it. For example, if the key pressed was the SRCDN key (meaning you want it to decrement the source picture number), the proper routine first makes sure the screen number is above one, and if it is, then decrements the number. It then converts the new screen number into a string, and calls a function which will insert the new string into the source picture number box. The AND, OR, and EOR buttons are mutually exclusive, meaning if you select one of them, it will make sure the other two are turned off.

The next two functions are related. The first, **adjust( )**, takes as parameters the address of the dialog box, the number of the object holding the string to change, the address of the new string to use, and the corners of the clipping rectangle for that particular object. The second, **set_text( )**, actually performs the work of inserting the address of the new string inside the object tree. To aid in moving strings around, two functions, **strcat( )** and **strlen( )**, are provided to allow concatenation of strings and the finding of the length thereof.

THE FAT LADY SINGS

Cleverly designed inside these two utilities is the method for installing your own GEM accessories. Throw most of my code away and build your own. I've only demonstrated one aspect of communication with the inside of DEGAS Elite. You have the ability to change and set colors, move, define, and manipulate blocks of graphics data, and more.

What can you do on your own? How about edge detection? Contrast stretching? I want somebody to write me a rubber-box source code generator for either C or assembly, or a way to combine two DEGAS pictures for a full page printout. Get to work—and soon we'll see a flood of Desk Accessories for DEGAS. ■

IF YOU'D LIKE TO SEE MORE ARTICLES LIKE THIS ONE, CIRCLE 185 ON THE READER SERVICE CARD.

Anne Doering

THE ASTRONOMER

YOUR COMPUTERIZED GUIDE TO THE HEAVENS

by Ignac A. Kolenko Jr.

Move over, Carl Sagan! Even if you can't say ''billions'' with a plosive ''b,'' you can still pick out those bits of star stuff from the rest of the cosmos. All you need to find your way around the night sky is a clear view, your ST and the aSTronomer, a universe-mapping program you'll find on your START disk.

As an amateur astronomer, the last thing I want to do before an evening of observing is to leaf through an astronomical magazine or almanac, searching for planetary positions, star maps, and other such items. I also don't care to spend five hours wading through massive spherical trigonometry formulas to get the information I want. Wouldn't it be easier, I thought, just to run a program on my ST, enter the current date and time, and in a matter of minutes have star maps and printouts of planetary positions? This is how the aSTronomer was born.

The aSTronomer is an easy-to-use GEM-based program written in Personal Pascal. I chose Personal Pascal because of its extensive support of GEM, and wrote the program with the user in mind. All keyboard input is done using dialog boxes, which helps eliminate inadvertent errors (such as entering a string when an integer is asked for), and all questions the program asks are answered with alert boxes. All program output can be sent to either the screen or the printer (which you can configure from a menu option). The program also works in both medium and high resolutions.

File ASTRO.ARC on your START disk

The aSTronomer can do many things that an amateur astronomer will find useful, and things that a beginner will find educational. With a few clicks of the mouse you can:

- select the latitude and longitude of your observing site anywhere on the Earth;
- select the time and date you want information for, over 100 years in the future, or hundreds of years in the past;
- print the positions of all the planets, Moon, Sun and nine different comets; and
- draw three different types of star maps, accurate and ready to use!

THE OLDEST SCIENCE

The science of astronomy is an ancient one. Since earliest times, man has wondered about the twinkling lights in the sky—why some of them moved as others remained stationary, why the Moon appeared to grow and shrink in size each month, and why the Sun seemed to disappear occasionally, swallowed by a blackened disk with a shimmering halo in an eclipse.

Ancient civilizations began to record such celestial events in calendars, and began formulating ideas about how the universe was structured. One noted Greek astronomer, Hipparchus, mapped the constellations and estimated the brightness of the stars; another, Ptolemy, devised the Earth-centered view of the universe, where everything, including the Sun, planets and stars revolved about the Earth.

The ideas of the early Greeks stayed with us for nearly two thousand years until the Renaissance, when Copernicus, Kepler and Galileo gave us a more accurate understanding of how the universe is structured. Since then, discoveries such as the planets Uranus, Neptune, and Pluto, the rings about Uranus and Jupiter, the explorations of the planets and the Moon by both U.S. and Soviet probes, and the periodic hype surrounding Halley's Comet have kept astronomy in the public's eye, and powerful radio-telescopes constantly scan the skies for new discoveries. But even after thousands of years there's still plenty for an ordinary person to see!

Many people living in large cities have never really taken the time to appreciate the beauty of the night sky. For most of them, a simple trip to the country with a pair of binoculars (or even just the naked eye) is enough to open the grandeur of space for them. With an Atari ST computer, the aSTronomer should help you see ahead of time what celestial items of interest are worth looking for, and to continue the fascination with the night sky that has been with us since man first appeared on Earth.

WHAT'S UP, DOC?

First, a few terms and facts.

What's up there? You've seen the Sun and the Moon; only a little more difficult to spot are the planets. The planets look like stars, but they seem to move slowly around the sky from week to week—and they don't twinkle as the stars do. The planets Mercury and Venus are known as either "morning stars" or "evening stars"; they seem to stay close to the Sun, and are usually the first or last objects you'll see in the night sky (more often Venus than Mercury, since Venus is far brighter). Jupiter usually dominates the night sky, because it is also a very bright planet. Saturn is a visual feast because of its rings—you can see them easily with all but the smallest telescopes! Mars is oc- ▶

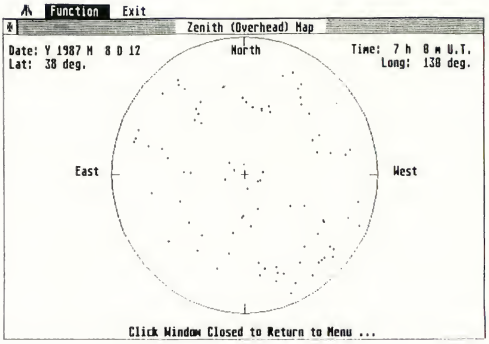
casionally bright enough to be dominant in the night sky and presents many interesting views (though, contrary to tradition, there are no canals or Martians to speak of!). The other planets in the Solar System are usually too faint to be seen easily by beginning astronomers.

Also in our Solar System are comets and meteors. Comets are "dirty snowballs," as Halley's Comet was so affectionately described: large balls of dust, ice and gasses, which hurtle toward the sun and then fly back out to deep space on a regular cycle. (There are a few comets, such as Encke, which have orbits similar to the planets.)

Meteors are usually called "shooting stars," and can be seen on practically every night of the year as bright streaks of light. On certain nights of the year, tens or even hundreds of meteors may be seen per hour at night. These displays are called "meteor showers"; they happen when the Earth passes through clouds of dust and debris left behind by the passage of comets. An excellent shower for the northern hemisphere occurs each year around August 11. Called the Perseids, since the meteors radiate outward from the constellation Perseus, this shower can produce up to 60 meteors per hour if you watch it in a dark site out in the country. Meteors are easy to watch, since all you need is a lawn chair and a blanket to keep warm!

Occasionally, if you live far enough north or south of the equator, you may be able to catch aurorae (northern or southern lights). Unfortunately, these are not easy to predict, since they depend on magnetic activity in the Sun.

Finally, there are the stars. With binoculars, thousands of extra stars are visible, and in a clear sky the Milky Way is especially breathtaking to scan with binoculars. If you look closely enough, lots of stars that seem to be single to the naked eye turn out to be double or triple (an example of this is the second star in the handle of the Big Dipper, a double known as Mizar and Alcor). With a larger telescope, it's easy to study nebulas and galaxies. It becomes apparent, with just a sweep of the sky with a pair of binoculars, that there is much more to the sky than twinkling stars – that there's literally a whole universe just waiting to be examined by those who will take the time.



A typical Zenith Map

STAR TALK

Before we get into the program, a little astronomical jargon. First, you can specify where stars are either by their *altitude* and *azimuth* or by their *right ascension* and *declination*.

The *altitude* is the angle above the horizon. At the horizon, the altitude is zero; halfway up, the altitude is 45 degrees; directly overhead, the altitude is 90 degrees. The *azimuth* is the compass direction – zero degrees is north, 90 degrees is east, 180 degrees is south, and 270 degrees is west.

A handy rule of thumb is that a clenched fist held out at arm's length is about ten degrees across. Thus if (at a particular time) Venus is at 20 degrees altitude, 260 degrees azimuth, you would face almost due west and look for Venus about two fists up from the horizon.

Another system is equatorial coordinates, using declination and right ascension. To get an idea of how they work, imagine that the sky and the earth are giant concentric globes, both turning on the same axis. Just like the earth, the sky has an equator, a north pole and a south pole. It also has latitude lines running parallel to the equator, and longitude lines running from pole to pole.

The latitude lines are called *declination* (abbreviated Dec.). Like regular latitude, it's the angular distance from the equator – up to 90 degrees north or south. Zero degrees declination is directly above the equator, while 90 degrees north is directly above the north pole, and 90 degrees south is above the south pole.

The longitude lines are called *right ascension* (abbreviated R.A.). Instead of being measured in degrees, it's measured in hours, minutes and seconds; the distance all the way around the "globe" of the sky is exactly 24 hours, and the zero point is located in the constellation Pisces.

Equatorial coordinates are used mainly for plotting star maps. The aSTronomer's Star Atlas menu option lets you choose a right ascension and declination to see what objects are in any

section of the sky.

Astronomy also has two ways of keeping track of time: Universal time and Sidereal time. *Universal time* (abbreviated UT) is just Greenwich Mean Time—the current time at the observatory at Greenwich, England. By quoting times in one known time zone, it's easy to convert times for other locations. For instance, Eastern Standard Time is five hours earlier than UT; thus 7 P.M. EST is midnight UT.

Sidereal time, or "star time," is just the right ascension of whatever star is directly overhead. Remember, depending where you are, a different set of stars will be directly overhead at any given time, so sidereal time is not an efficient way of reporting astronomical events; it's usually used for orienting large telescopes to locate particular stars.

This isn't a complete introduction to astronomical terms, but it should make it a little easier for you to use the aSTronomer. Now, on to the program!

RUNNING THE PROGRAM

To run the aSTronomer, first un-ARC the files in ASTRO.ARC. Then create a new folder named ASTRONOM.Y, and copy HELP.DOC and the six .DAT files into the folder. Finally, double-click on ASTRONMY.PRG, and you're ready to go.

The first time you run the program, just try this: Under the Location menu set the location to your own latitude and longitude, and with the Clock menu set the date and time (remember, it's in Universal time). Now choose Sky Plot from the Almanac menu, and your ST will plot a view of the sky on your screen. By pressing Alt-Help, you can print the map on your printer.

That may be all you'll ever need the aSTronomer for—but there's more information in the other menu options . You can explore the program by moving the mouse across the menu bar, and as you do, you'll learn a lot more about astronomy, too.

THE MENU OPTIONS

Desk

the aSTronomer—show program information

Options

Print Out—toggle printer output for Solar System table of values
Set Printer—select printer for screen dumps
White Screen—toggle white-on-black or black-on-white star maps
Help File—get on-line help
Quit—return to Desktop

Location

Latitude—enter latitude in degrees, minutes and seconds North or South
Longitude—enter longitude in degrees, minutes and seconds East or West

Clock

Date—set date
Time (UT)—set time in Universal time

Almanac

Solar System—calculate table of positions for solar system
Sky Plot—plot star map as Horizon Map, Zenith Map, or Star Atlas

Most of the options are straightforward. Remember that you must set the time to UT, not your local time. In New York, add five hours to your local time; in Chicago, add six hours; in Denver, add seven hours; in San Francisco, add eight hours; and in Saudi Arabia, subtract four hours.

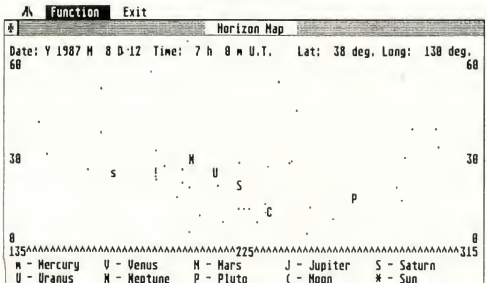
The Sky Plots may take a minute or more because so much data must be manipulated. There are three different versions: Horizon Map, Zenith Map, and Star Atlas.

The Horizon Map lets you choose a direction to look (the azimuth) and then displays the sky as it appears from the horizon up to 60 degrees altitude. The Horizon Map also superimposes the positions of the planets, comets, Sun and Moon on the star map.

The Zenith Map shows the entire sky at once (this is the type of map that's published in newspaper astronomy columns). If you use black stars on a white screen, it's easy to print out the Zenith Map using Alt-Help. It's one of the easiest ways to get a star chart to compare with what you see in the sky.

Finally, the Star Atlas is a highly detailed star map. Unlike the Horizon and Zenith maps, the Star Atlas just gives you one section of the sky, which you specify by right ascension and declination. The sample coordinates will create a star plot of the constellation Orion and the area around it. ▶

A typical Horizon Map



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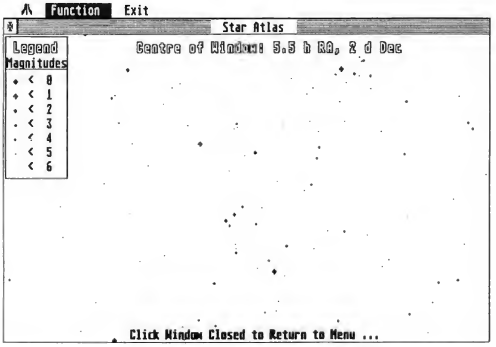
ASTRONOMER...



The constellation Orion from the Star Atlas

That's how to use the aSTronomer. As I said before, it's fun to experiment; you can see the results of plots made an hour apart, or a day apart, or a month apart. With this program, it's extraordinarily easy to create a map of exactly the night sky you want to look at.

SPECIAL FEATURES

The formulas used in this program are standard astronomical and spherical trigonometry. For those interested in learning more about the formulas used, consult books such as *Practical Astronomy with Your Calculator,* by Peter Duffett-Smith (Cambridge University Press, 1979), or *The Observer's Handbook* (University of Toronto Press, yearly).

Since Personal Pascal doesn't have any built in functions to convert from numbers to strings and vice versa, I had to devise my own. The more useful of the two functions turned out to be **Val (Snumber : string) : real,** which converted the string Snumber into a real number. This was needed since the data returned by dialog boxes are in string format, and I needed a way to convert those strings to numerical data. Also, all the data in the files in the ASTRONOM.Y folder are in text format, and I needed a way to convert them from text to real number format.

The other useful procedure was my version of the C function itoa(), **itoa (x : integer; var s : string),** which converts an integer (positive or negative) into a string of length up to six. I needed this to convert the system date and time into strings for the date and time dialog box defaults and for the table of Solar System data.

Other features include the use of BIOS, XBIOS and GEMDOS calls directly in the Personal Pascal code. This allowed such things as accessing the system date and time, getting the resolution of the screen, setting the printer port and getting single key input. Also, the built in VT-52 emulator in the Atari ST computer came in handy for the **PrintAt (x,y : integer)** procedure, which was used to place the cursor at an (x,y) position on the screen.

For the plotting routines (in the Sky Plot section), the Horizon Map plotting routine is quite simple to understand. The horizontal azimuth coordinates are compared to the limits of the horizon to be plotted, and the altitude coordinates are checked to see that they are between 0 and 60 degrees. It is then a straight translation of those coordinates into (x,y) plotting coordinates.

The Zenith Plot is slightly more complicated. It takes the horizontal coordinates from the star database called CONST.DAT. It then converts those coordinates (which are, in mathematics, just polar coordinates) into Cartesian coordinates, which are easy to scale to the screen resolutions.

The Star Atlas was by far the hardest to accomplish. It involves taking the equatorial coordinates of the large star databases (called S_RA.DAT, S_DEC.DAT and S_MAG.DAT) and converting those spherical coordinates into three-dimensional Cartesian coordinates (x,y,z). These coordinates are first rotated in the (x,y) plane by an angle equal to twelve hours right ascension minus the right ascension of the window center. Then the coordinates are rotated in the (x,z) plane by an angle equal to the declination of the window center.

The three dimensional coordinates are then reconverted back to right ascension and declination (equatorial coordinates), and a simple conversion routine plots the stars onto the screen without distortion. The rotations must be performed; otherwise you get an unacceptable amount of distortion as you plot closer and closer to the north and south celestial poles. (It's like the distortion you find on a Mercator map of the world, which always shows Greenland much larger than Australia, whereas the opposite is true.) The rotations make it possible to plot the sky as if it were centered about 12 hours right ascension, 0 degrees declination, which can be plotted easily without distortion.

For these rotations, all angles are calculated before entering the loop that goes through the entire star database, and thus speeds up plotting. Unfortunately, since rotations invariably use trigonometry functions (sines and cosines), plotting slows down, but not tremendously. The stars are plotted in relation to their brightness (that is, the brighter the star, the larger the dot that is plotted). This is done by comparing the magnitude of the star from the large star database. ▶

ASTRONOMER...

THE DATA FILES

The PLANETS.DAT file is a sequential data file consisting of the orbital elements of each of the planets in the Solar System. Each planet has an entry which is structured as follows: name, period of revolution (years), longitude at the start of 1980 (degrees), longitude of closest approach (degrees), eccentricity of the orbit, semi-major axis of the orbit (astronomical units), inclination of the orbit (degrees), longitude of the ascending node (degrees), angular size at one astronomical unit (arc seconds), and a brightness factor. A good astronomical manual can further explain each of the above orbital elements.

The COMETS.DAT file is also a sequential data file with the following structure: name, year of closest approach, longitude of closest approach (radians), longitude of ascending node (radians), period in years, semi-major axis (astronomical units), eccentricity of orbit, and the inclination of the orbit (radians). The cometary data is, unfortunately, very prone to obsolescence, since the larger planets, Jupiter and Saturn, have enough gravitational pull to change the orbital elements from time to time. If the data does change, then I will make every effort to get a new data file out to replace the old one.

The CONST.DAT file holds the values for the right ascension and declination of over 150 of the brightest stars, which are used by the Horizon Plot and Zenith Plot menu options. The format for this file is: right ascension (in hours), and declination (in degrees).

The file S_RA.DAT is another sequential file which contains only the right ascensions of over 1500 stars. The format for each entry is HHMM.M, which means that the first two characters are hours, the next two are minutes and the final is a fraction of a minute. Thus, if an entry is 01588, the right ascension of that star is one hour, fifty-eight point eight minutes.

The S_DE.DAT file, which contains declinations, is set up much the same way. Each of the star entries have a format of SDDMM, where S is the sign of the declination (either positive for north or negative for south), DD for the degrees, and MM for the minutes of arc.

Finally, the S_MAG.DAT file contains the magnitudes or brightnesses of each of the over 1500 stars. Each of the entries just consists of a number, positive or negative, corresponding to the magnitude of that star. The smaller the number, the brighter the star.

The HELP.DOC file is simply an ASCII text file.

Many people living in large cities have never really taken the time to appreciate the beauty of the night sky.

AD ASTRA

If the aSTronomer increases your interest in astronomy, just go to your nearest library and read up on mankind's oldest, and still perhaps most interesting, science. I hope that amateur astronomers will find the data generated by this program an excellent supplement to their studies, and that beginning astronomers, and people with no previous interest in astronomy, will be able to pick up new information and gain an appreciation of the starry heavens. ■

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BENCHMARKS:

A) 1M empty FOR/NEXT loops
B) Integer calculations (see listing 1)
C) Float benchmark (see listing 2) (1)
D) Calc, standard BYTE magazine benchmark (May 85) (1)
E) Sieve benchmark, determine first 1651 primes
F) Screen output 1000 strings of 70 characters (50 X 20 lines)

Speed comparison (all times in seconds)

	LDW Basic	FAST Basic	GFA Basic	GFA Comp	ST Basic	Alcyon 'C'	Megamax 'C'	MWilliams 'C'
A)	6.7	66	48.1	17.1	303	5.7	5.7	6.7
B)	4.3	526	527	168.2	1100	5.9	6.1	6.3
C)	3.5	6	10.2	8.7	15.5	3.4	59.8	37.2
D)	2.8	7.2	6.0	3.5	16.3	2.6	11.9	10.4
E)	0.5	16	14.0	1.3	38.3	0.43	0.46	0.48
F)	13.9	256	23.3	21.9	226.6	N/A	63	42.7

(1) All floating point benchmarks are in single precision, however, some 'C' compilers perform all floating point arithmetic in double precision

Listing 1

```
for i% = 1 to 10
  for i% = 1 to 30000
    z% = 2/5 + 3*2 + i%
    z% = 2*3*4*5
    z% = 2 + 3 + 4 + 5
    z% = i% + i%
  next i%, i%
```

Listing 2

```
x = 1
for i% = 1 to 1000
  a = sqr(x).a = log(x)
  a = log10(x).a = exp(x)
  a = sin(x).a = cos(x)
  a = tan(x).a = atn(x)
next i%
```

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- And many more!

Comparison Chart of Different Basic Implementations.

	LDW	FAST	GFA	GFAcom	ST Basic
Double precision	+	+	—	—	+
Flexible arrays base	+	—	—	—	+
CHAIN with COMMON	+	—	—	—	+
ST BASIC compatible	+	—	—	—	+
True random files	+	+	—	—	—
Multi-line statements	+	—	—	—	—
Multi-statement lines	+	—	—	—	+
Works with line numbers	+	—	—	—	+
Works without line numbers	+	+	+	+	—

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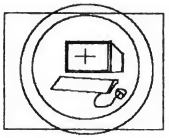

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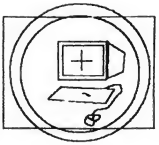

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PUBLISHING PARTNER: A REVIEW

THE ST DESKTOP PUBLISHING BOOM BEGINS

BY CHARLES F. JOHNSON

There are some programs that, in themselves, make it worthwhile to purchase the computer they run on. Certainly, many people bought IBM PCs simply to run Lotus 1-2-3 or dBase. Publishing Partner is such a program for the Atari ST; a program whose power and usefulness are limited only by the imagination of the person using it. If you think you sense a "rave review" coming, you're right—but my satisfaction with Publishing Partner is slightly clouded by a few bugs that persist through the latest version of the software.

Desktop publishing is a rapidly growing new genre of software, allowing the design and production of professional-looking documents (with either a dot matrix printer or a laser printer) on a personal computer. Programs such as Print Shop for the 8-bit Atari computer and Print Master for the ST are very simple examples of page design tools. With these programs you can create greeting cards, banners, calendars, and the like. Publishing Partner offers an infinitely more elegant and open approach; with it you really can design almost any type of document you can imagine.

Publishing Partner is a full-featured desktop publishing program written entirely in 68000 assembly language. It's somewhat reminiscent of Aldus's PageMaker for the Macintosh. It works in either monochrome or medium-resolution color on the ST, but monochrome is preferable; in medium-res, text characters and graphic objects may appear somewhat distorted, though they look fine on the printer.

With Publishing Partner, you work on full printer-page sized documents and can only see a portion of the page on screen at once, unless you choose the "View Full Page option." It allows you to create columns and enter text into them, draw graphics, import pictures created with DEGAS or NEOchrome (it even handles the popular public domain TINY picture compression format), and much more. Partner reads picture files saved in any resolution and converts them to the resolution you're using. You can resize and crop any column, graphic object, or picture in any direction. When you enter text into columns, Partner functions as a word processor with justification, word-wrap, block move, delete and other standard features, and your text is constantly reformatted as you type. Resizing a column with text in it will cause all the text to be quickly readjusted to the new column size. One more very nice feature: the program is *not* copy-protected and can be easily backed up and installed on a hard disk or a RAMdisk.

When you load Publishing Partner, you'll see the screen shown in *Figure 1*. The familiar GEM drop-down menus are there, along with a column of tools and other icons along the right side of the screen. The main screen displays the upper left-hand corner of the document when first booted; there are GEM-like window sliders and scroll bars enabling you to move around in your document and view different sections.

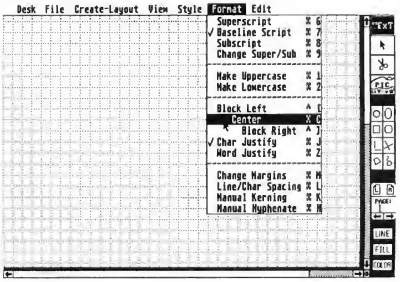
There are many ways to view your document: You can view multiple pages (two pages at a time—see *Figure 2*), show the full page, show actual size, 50% size, or 200% size. If this

isn't enough for you, you can set your own scale for viewing the document. An acronym you'll see a lot in articles about desktop publishing is WYSIWYG (enunciated "wizziwig"), which stands for "What You See Is What You Get" – and that describes the Partner approach exactly. At all times, you see a very close approximation of what your eventual printed copy will look like. In some sizes, text may not be readable and pictures may not look quite right (especially in the "View Full Page" mode), but they'll look correct when you print them.

Publishing Partner has a dizzying array of type styles (far more than GDOS currently allows) including backslant, bold, double-underline, italics, light, mirror, outline, reverse text, shadow, strike-through, tall, upside-down (?), and wide. Whew! Character size is referenced in terms of *points*, a typographer's term (a point is about 1/72 of an inch). You can adjust type sizes all the way from 3 to 72 points, and the program supports multiple type faces, but it is being shipped with only two at present (SoftLogik promises more on the way). All these text options are selected from customized, non-GEM dialog boxes, which allow more flexible input than the normal GEM routines. And all the text is fully proportional; the program will even let you adjust the spacing between individual letters in a word, an option called "manual kerning" (another typographic term).

To define a column in which you'll enter text, all you need to do is choose the arrow tool from the toolbox on the right,

FIGURE 1. Start-up screen of Publishing Partner.



point at the starting place with the mouse, and drag an expanding box to the desired size. You can arrange columns so text will flow automatically from one column to the next; Partner calls this feature "text routing." By using text routing, it's easy to construct multi-page documents. You use the mouse to mark blocks of text and change typestyles, point sizes, justification, centering and other attributes.

Unfortunately, the text routing portions of the program seem to be the most bug-ridden. Occasionally, when resizing text that extends through multiple columns, Publishing Partner will briefly show two or three bombs and then dump you back to a frozen desktop. This problem is most likely to occur if you're changing text to a larger size.

The program lets you draw designs directly on your document free-hand with the mouse, and also gives you a comprehensive set of graphics drawing tools. You can draw lines, connected lines, vertical and horizontal lines, circles, boxes, boxes with rounded corners, and ellipses; and all these graphic objects can be filled with one of a number of patterns. Anything you draw will become a graphic object, and can be resized, cropped, and moved about at will.

In addition to its own graphics features, it's a simple matter to use pictures created with DEGAS or NEOchrome. You simply enter "Picture" mode, and choose the Import option from the File drop-down. Your picture is copied into a workscreen, from which you can cut a block and place it in the "copy buffer." Then you just flip back to your document, and use the "Copy from Buffer" option to place the picture at the desired position. After you've placed the picture, you can manipulate it in the same way as any other graphic object. Resizing pictures may sometimes cause them to appear distorted on screen, but I found that even the most distorted pictures would usually look fine when printed.

You're not limited to an 8½" by 11" page, either. Publishing Partner lets you custom-design any page size your printer can support, with settings measurable down to eighths of an inch. Once you've created a document, you can choose the "Show Rulers" option to display vertical and horizontal rulers for extremely accurate placement of text and graphic objects (see *Figure 3*). Small indicators on the rulers show the exact position of the mouse pointer on the screen, to make this operation even easier. You can also set the rulers for inches, picas, or centimeters.

Publishing Partner uses a proprietary method of handling text output to screen and printer. It does not use Atari's GDOS, contrary to early reports. The Partner method is actually much more flexible than GDOS, giving you many more text styles and font point sizes. The program comes with drivers for many popular brands of printers, including a Postscript driver for the Apple Laserwriter or any printer capable of using the Postscript page description language. It also has drivers for most Epson-compatible 9-pin dot matrix printers, and drivers for the new 24-pin printers like the NEC P6.

If you're using a 9-pin dot matrix printer, be prepared to wait a long time for your hardcopy to be finished. Partner uses the quadruple-density graphics mode of these printers, and does four passes of the printhead to print each line. This results in unbelievably clear print quality, with none of the dots and jagged lines you may be used to seeing on your printer; but a typical time to print a one-page 8½" by 11" document is 20-30 minutes. The most recent version of the ▶

Publishing Partner...

program has improved the print speed somewhat by buffering the picture data and tabbing past blank space, but this is more a limitation of dot matrix printers than of Publishing Partner's.

By now you might be thinking you should go buy this program right away. I'm sorry to have to report that some bugs still remain in the program (as of version 1.01). I've managed to make the program crash all the way back to the desktop (a non-functioning desktop, at that) quite a few times—and not always in repeatable ways, either. On the most recent occasion, all I was doing was typing text into a column. Another time I was resizing text in linked columns; the program worked fine for a few operations, then suddenly, bombs away! A rude interruption, to say the least. Another problem: sometimes deleting a column of text does not release the memory it used, and you end up with an "Out of Memory" error. At least this problem is non-fatal; you can just save the document, quit and restart the program, and the memory is back.

I've learned to save documents very often when working with Publishing Partner, because I just don't trust the program to run very long without crashing. This casts a definite pall over my enjoyment of Partner—it's just about the only negative aspect of the program, but it's a large one! However, SoftLogik is aware the bugs exist and is regularly releasing updates with fixes for the problems.

I have a few minor quibbles with Publishing Partner's user interface. Those custom dialog boxes that let you adjust character and line spacing and manual kerning are very nice, but the response time is so fast that I found it almost impossible to change spacing by increments of one point. The value would always jump two or more, no matter how quickly I pressed and released the mouse button. The way Partner handles the GEM file selector is also rather awkward—the box comes up without a drive specifier on the directory line, making it difficult (but certainly not impossible) to change disk drives. And there's no provision for grouping objects together:

FIGURE 2. The "Show Multiple Pages" option.

For example, say you create a column of text and then decide that a line would serve nicely to separate one section from another. There's no trouble with drawing the line where you want it, but if you decide later to move that text column, the line doesn't move with the rest of the column. You have to reposition it manually.

Publishing Partner is one of the most impressive programs to appear for the Atari ST; indeed, it's one of the most impressive programs I've seen for any computer. (What makes it even more incredible in these days of programming teams is

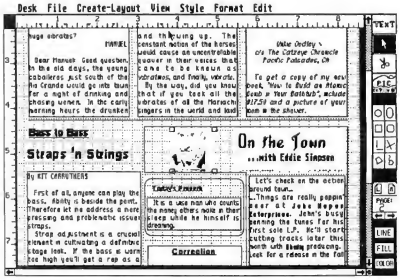


FIGURE 3. "Show Rulers" with "Show Full Width".

that the program is the work of one man, Deron Kazmaier.) SoftLogik is very committed to supporting their product. They've released public domain screen font editors and printer fonts, which are available on many online services, such as CompuServe or Delphi. SoftLogik has shipped the first update (with some bug fixes) to registered owners, and Kazmaier is constantly updating Publishing Partner's printer drivers and adding new printers to his "supported" list. So, in spite of its current bugs, I highly recommend this program. ■

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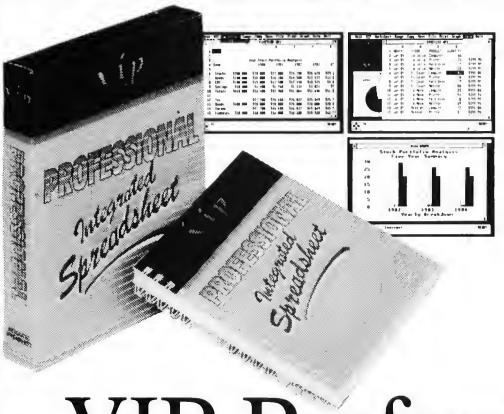

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PLUMBING GEM'S MYSTERIES

WRITING TO THE DESK ACCESSORY PIPELINE

by Tom Hudson

Pipes—the final frontier. Contributing Editor Tom Hudson shows how you can get at GEM's internal communications plumbing without using a monkey wrench or calling Roto-Rooter. Tom's example program, a desk accessory for DEGAS Elite, is on your START disk.

Until recently, I've never had a lot of use for desk accessories. Like most people, I saw them as little programs that allowed you to change the default screen colors, install your printer, set the system clock or do other simple tasks. I usually didn't bother using accessories much, because they took up RAM that I needed for program development. Accessories such as Thunder!, from Batteries Included, show that accessories can do much more than just sit there using memory. They can really perform a useful function in conjunction with the primary application.

While developing DEGAS Elite in the summer of 1986, I was perusing the GEM AES (Application Environment Services) manual and happened to notice several interesting-looking AES functions that I had never used before.

File DECOMM.ARC on your START disk

The first function, **appl_find()**, allows a GEM application (either the main application or a desk accessory) to locate another application or desk accessory and obtain its **ap_id**, or "application identifier," a unique number that is assigned to each accessory or application currently in memory. "That's nice," I said skeptically, "but what good is that?" Then I read it: *The application must know the* **ap_id** *before it can establish communications with another application!* What's this? You mean programs can *talk* to each other?

My question was answered almost immediately, as I moved on to the other two communication functions, **appl_read()** and **appl_write()**. These two functions have proven to be a virtual goldmine, and in this article I will demonstrate how to use them to expand your program functions without having to change the main program.

THE PIPELINE

At the core of the GEM program functions is a simple message system known as the message pipe. If you've ever written a GEM application, you'll be familiar with this system. By using the **evnt_mesag()** or **evnt_multi()** functions, your program waits until GEM sends it a message telling it that the user has taken some action the program must re- ▶

spond to. GEM has a simple set of predefined messages for such functions as menu bar item selection, setting window control points, moving or sizing windows, and so on. Each of these messages is set to a standard length of 16 bytes.

The interesting thing is, your programs can easily send messages to another application in the system, or even to itself, impersonating the GEM event manager! The standard message is 16 bytes in length, but user-defined messages can be larger, if desired. This process is actually quite simple, but there are a few guidelines that should be followed, and a few problems you should watch out for. If properly done, communication pipe inter-application communications is a reliable way for programs to exchange information.

LET'S GET TALKING!

The standard GEM message is a 16-byte chunk of data, organized into eight words, as follows:

WORD 0: Message number
WORD 1: The **ap_id** of sending application
WORD 2: Additional bytes in message (if more than 16 bytes)
WORD 3: Message-specific
WORD 4: Message-specific
WORD 5: Message-specific
WORD 6: Message-specific
WORD 7: Message-specific

Word number zero, the message number, must be a unique value ranging from $0000 to $FFFF. Messages 0-41 are used by GEM, so if you're going to define your own messages, be sure to use a number other than those reserved for GEM, or you might confuse the receiving application!

Word 1 is the ID of the application that's sending the message. When sending messages, it is important to place the proper **ap_id** in this location. Without a proper **ap_id** here, the application that receives the message won't know where it came from, and if it tries to respond by sending a message back, GEM may get confused. The moral of the story: Always know your application's **ap_id**. Fortunately, you can always find your program's **ap_id** in the global variable **gl_apid**. In C, you can define this variable as follows:

```
extern int gl_apid;
```

When sending a message, just move **gl_apid** to word 1 of the message.

Word 2 in the message is the extra number of bytes in the message. For a standard 16-byte message, this value is set to 0. For a 20-byte message, the value here would be 4 (20-16). The minimum message size is 16 bytes.

Until recently, I didn't bother using desk accessories much because they took up RAM that I needed for program development.

The remaining five words in the standard message are available for data. When designing messages for your programs' use, you can fit up to five pieces of word-sized data in a standard message. If you need to pass more data, you can do so by specifying the extra number of bytes in word 2, and sending the extra bytes through the pipe with the **appl_write( )** function. The receiving application can get the extra bytes from the pipe by using the **appl_read( )** function. For extremely large blocks of data, pointers to the data may be passed in the standard message.

Now that we know what the message format looks like, let's see what is necessary to send it.

ADDRESS UNKNOWN?

In order to send a message to another application or accessory, it is vital that you know the **ap_id** of that program. Without the proper **ap_id** of the receiving application, it's like dropping a letter into a mailbox without the name or address of the person you're sending it to. It just won't get there.

The AES function **appl_find( )** will allow you to locate the application you would like to communicate with, and will give you the proper **ap_id**. The format of the function is:

```
target_id=appl_find("APPLNAME");
```

"APPLNAME" is a null-terminated string specifying the filename of the application you want to find and **target_id** is the variable that holds the target application's **ap_id**. The program name string is eight characters in length plus the terminating null character (0), and is simply the main portion of the application's filename. If you were looking for a program called RATTFINK.PRG, you would use: **appl_find("RATTFINK")**. Similarly, if you're looking for CLOCKSET.ACC, you would request: **appl_find("CLOCKSET")**. If the filename is less than eight characters, such as SHORT.PRG, you must pad the remainder with spaces:

```
target_id=appl_find("SHORT   ");
```

The **ap_id** of the target application will be returned in **target_id**. If the specified application name was not found, GEM will return a -1 in **target_id**. One word of special caution here: If the target application is a program and was the last program that was executed, a bug in the current ST ROMs will return a seemingly valid **target_id**, while the application is not resident at all! If the program (usually an accessory) tries to communicate with the target application and expects a reply, it will have a long time to wait, because the application isn't there! We'll see how to cope with this later.

Once you know the **ap_id** of the target application, you're ready to start talking to it. Simply build a message in an eight-word array, like so:

```
message[0]=0x4000;
message[1]=gl_apid;
message[2]=0;
message[3]=1234;
message[4]=0;
message[5]=0;
message[6]=0;
message[7]=0;
```

In this example message, we're sending a message number of $4000 (safe because GEM only uses message numbers 0-41). We have placed the **ap_id** of our application (**gl_apid**) in message[1]. The message is 16 bytes long, the standard length. Note that message[2] is set to zero, indicating that there are no extra message bytes. The message in this case is a simple numeric value, 1234, in message[3].

Okay, we've built our message buffer, now let's send it. For this function, we'll use the **appl_write( )** function. This function has three parameters, as shown below:

```
success=appl_write(target_id,
        msg_size,msg_buff);
```

The **target_id** parameter is a word that tells GEM the **ap_id** of the application we want to send the message to. The **msg_size** parameter is a word that tells how many bytes there are in the message, and **msg_buff** is a pointer to the message buffer array. The success variable is set to zero if an error occurred, or a positive value if the write was successful. Let's say we want to send the above message to a desk accessory called TESTER.ACC. The following code would get the job done:

```
target_id=appl_find("TESTER   ");
if(target_id>=0)
success=appl_write(target_id,
 16,message);
```

Simple enough? Sure. However, we still don't know how to make the TESTER.ACC program look for and acknowledge this message.

THE RECEIVING END

Normally, a typical GEM application or desk accessory will sit around waiting for a message to come into its message pipe. This is accomplished by using the **evnt_mesag( )** or **evnt_multi( )** functions. For simplicity, we'll use the **evnt_mesag** function, which is the more straightforward of the two.

Somewhere in our TESTER.ACC program, there will be an **evnt_mesag( )** function call, looking something like this:

```
evnt_mesag(mess_in);
```

What's this? You mean programs can *talk* to each other?

Usually, an inactive accessory will only receive one of two messages from the GEM event manager: 40 (AC_OPEN) or 41 (AC_CLOSE). We can make it recognize our custom message merely by testing the message number of the incoming message for our special code! For example, to have the accessory look for the $4000 message we sent earlier, this is the code we would need:

```
int mess_in[8];
    .
    .
    .
evnt_mesag(mess_in);
if(mess_in[0]==0x4000)
{
(WE GOT THE MESSAGE!)
(PRINT OUT mess_in[3])
}
```

It's that simple! No muss, no fuss. The 16-byte message buffer (**mess_in**) will be filled with the 16-byte message that was sent by the other application, and it's ready to be used by the accessory.

TWO-WAY MESSAGES

In many cases, you'll want to have one application send a message to another application, requesting specific information. For example, a desk accessory may need to know the address of a data buffer within an application. This type of message requires two-way communication, which is a little more tricky.

When I design a two-way message, I usually set it up so that message numbers with a low byte of $00-7F are requests, and message numbers with a low byte of $80-FF are replies. For example, a request for information might be message number $4000, and the reply for this message is $4080. The reply is always the message number with $80 added to it. This makes for a uniform message system, and prevents a program from being confused by a different message.

Let's change our above example so that the application is requesting information from the accessory. The application will send a message to the accessory, which will in turn send a reply back to the application program. The application program, after sending the message to the accessory, will wait for a reply from the accessory before proceeding.

The application code might look like:

```
/* SEND MESSAGE TO ACCESSORY */
target_id=appl_find("TESTER   ");
if(target_id>=0)
{
message[0]=0x4000;
message[1]=gl_apid;
message[2]=0;
message[3]=1;
message[4]=message[5]=message[6]
=message[7]=0;
appl_write(target_id,16,message);
/* WAIT FOR REPLY */
```

```
do
{
evnt_mesag(message);
}
while message[0] != 0x4080;
}
/* REPLY RECEIVED, CONTINUE
PROCESSING */
```

As you can see, the application writes the message normally, then goes into a loop that waits for an **evnt_mesag** with a message number of $4080, the reply to message number $4000. As long as the target accessory is in memory, everything should work perfectly. If messages other than number $4080 are received by the application, it ignores them and continues waiting. (Note: It may be necessary, in certain rare instances, to process other messages received by this loop, such as redraw messages. This is usually not the case.)

The accessory code that would process this message is as follows:

```
int mess_out[8];
    .
    .
    .
/* WAIT FOR MESSAGE FROM THE
PIPE */
msg_wait:
evnt_mesag(mess_in);
if(mess_in[0]==0x4000)
{
mess_out[0]=0x4080;
mess_out[1]=gl_apid;
mess_out[2]=0;
mess_out[3]=1;
mess_out[4]=2;
mess_out[5]=3;
mess_out[6]=4;
mess_out[7]=5;
appl_write(mess_in[1],16,mess_out);
}
goto msg_wait;
```

When the accessory code receives message number $4000, it just builds a reply message with the proper reply message number ($4080), places its **ap_id** in **mess_out[1]**, and builds the rest of the message accordingly. It then writes the message to the message pipe using the **appl_write( )** function. Note that it used the value that it received in **mess_in[1]** as the **ap_id** of the application that it is sending to. This is *extremely* important! If the original sender does not supply the proper **ap_id** in its message, the receiving application/accessory cannot successfully reply. Don't forget to place the **gl_apid** into the second word of the message buffer!

The real power lies in being able to build more complex programs out of smaller pieces, or modules.

To summarize this sequence of communications operations:

1. Program #1 gets the ID of the program it wants to communicate with;
2. Program #1 builds and sends the message;
3. Program #1 enters evnt_mesag( ) wait;
4. Program #2 receives the message;
5. Program #2 composes reply message, sends to original sender;
6. Program #2 returns to message wait state;
7. Program #1 receives reply from program #2, continues processing.

This is a fascinating process, and can be extremely useful. We'll see a real-world application of the technique in a moment. In my latest application of the communication pipe, CAD-3D 2.0, the main program uses desk accessories to perform optional peripheral operations, such as animation scripting, animation recording, and graphics antialiasing (smoothing of jagged lines). Each of these accessories is independent, and in some cases the communication path can become quite complicated, with processing often passing from accessory to the main program to a second accessory and back! To actually watch it happen is amazing.

To me, though, the real power lies in being able to build more complex programs out of smaller pieces, or modules. These modules can be designed to be periodically upgraded to newer versions that do a more efficient job, without having to change the main application. Further, an extensive communication protocol can be built into the main program, allowing it to be controlled remotely by a desk accessory. This possibility becomes more practical as newer ST computers, with more memory, are introduced. Theoretically, a desk accessory could be as large or larger than the original program, and they could work together to perform more advanced functions.

SOME WORDS OF CAUTION

The successful use of the communication pipe with customized messages depends on a well-defined communication protocol. If possible, send the entire message in the standard message length of 16 bytes. Use pointers if you're sending large blocks of data. If your application will be sending a large number of messages quickly, one right after another, use the two-way request/reply system shown above to avoid overflowing the pipe. The receiving application may have to do a bit of processing for each message – play it safe.

As I mentioned earlier, it is possible for a desk accessory to request the **ap_id** of an application and get a valid id, even though the application has terminated. If this happens, the accessory may send a message to the application and sit there forever, awaiting a reply that will never come. You don't want that to happen (take it from someone who knows from experience). Here's a good solution to this dilemma.

Send an information request to the application (one that requests information only and does not command the application to take action) and then call the **evnt_multi( )** function waiting for either a message or a timer event. Set the timer length to 2000 milliseconds. If you get the reply from the application before the timer event occurs, the application is really present and you can proceed. Do this every time the accessory is activated from the desktop DESK dropdown. It is not necessary if the application has called the accessory. This **evnt_multi** may look something like this:

```
check_it:
event=evnt_multi(0x0030,-1,-1,-1,
                 0,0,0,0,0,
                 0,0,0,0,0,
                 mgbuf,
                 2000,0,
                 &rdum,&rdum,&rdum,
                 &rdum,&rdum,&rdum);
if(event & 0x0020)
(APPLICATION NOT PRESENT)
else
if(mgbuf[0]==REPLY)
(APPLICATION PRESENT)
else
goto check_it;
```

This is a reliable test to be sure the application is really there. If the application was previously run but is not currently running, the timer event of 2000 milliseconds (2 seconds) will expire before a reply message is received.

REAL WORLD EXAMPLES

The file DECOMM.C on your START disk is a real-world example of the communication pipe. This is the source code for a desk accessory that "talks" to DEGAS Elite and gets information on the screen being used, the screen buffer locations, block size and more. If you've seen the TINYLOAD.ACC accessory for DEGAS Elite, you've seen another example of the technique in use. This is a very practical use of the communication pipe. The DEGAS Elite program was getting so large that it barely fit into 512K systems, so I decided to make the program expandable through desk accessories. The accessories can ask Elite where its screens are and which screen is in use, then load data into the screens and change the palette. Let's see how it works.

Theoretically, a desk accessory could be as large or larger than the original program, and they could work together to perform more advanced functions.

DEGAS Elite supports five communication pipe commands, numbered $DE00 (DE–Degas Elite–get it?) through $DE04. These commands are listed below.

Screen Buffers.

$DE00–Request screen addresses. This command simply asks DEGAS Elite to tell the accessory where the screen buffers are located. The message is formatted as follows:

message[0] = $DE00
message[1] = Accessory ap_id
message[2] = 0
message[3] = Unused
message[4] = Unused
message[5] = Unused
message[6] = Unused
message[7] = Unused

DEGAS Elite will respond with message $DE80, the reply for $DE00. This message is formatted as follows:

message[0] = $DE80
message[1] = DEGAS Elite ap_id
message[2] = 0
message[3] = Low word of pointer to screen buffer pointer array
message[4] = High word of pointer to screen buffer pointer array
message[5] = Number of pointers in array
message[6] = Unused
message[7] = Unused

This reply message is fairly straightforward. Message words 3 and 4, when put together, form a pointer to an array of pointers that point to the various screen buffers within DEGAS Elite. Message word 5 tells how many pointers are contained in the array. The array currently contains 13 pointers, allocated as follows:

array[0] = Pointer to main menu screen (don't alter!)
array[1] = Pointer to drawing screen #1
array[2] = Pointer to drawing screen #2
array[3] = Pointer to block buffer
array[4] = Pointer to Block mask buffer
array[5] = Pointer to Block work buffer
array[6] = Pointer to Undo buffer
array[7] = Pointer to drawing screen #3 (0 if not present) ▶

array[8] = Pointer to drawing screen #4 (0 if not present)
array[9] = Pointer to drawing screen #5 (0 if not present)
array[10] = Pointer to drawing screen #6 (0 if not present)
array[11] = Pointer to drawing screen #7 (0 if not present)
array[12] = Pointer to drawing screen #8 (0 if not present)

Future versions of DEGAS Elite may support more than 8 drawing screens, so be sure to look at message[5] for the number of pointers. As noted above, if the screen pointer is zero, the screen buffer was not allocated. Do not use these buffers. Two buffers may be used by the accessory for "scratch" buffers. These are array[5] and array[6]. The array[5] buffer is a temporary work area used when drawing with a block image, and the array[6] buffer is the Buffer used to hold the image temporarily for the Undo key. These are discarded when you return to the menu screen, and so are available for use by your accessory. Note that they may not be aligned for proper display use—use them *only* for data buffers or work areas, not display screens.

If you want to check to see if DEGAS Elite is really there (to circumvent the **appl_find** GEM bug), $DE00 is a good message to use, as the reply is sent back immediately.

Current Screen.

Since DEGAS Elite has up to eight drawing screens available, your accessory may need to know which one is currently in use by the user. The next command, $DE01, will request the screen number. This message is formatted as follows:

message[0] = $DE01
message[1] = Accessory ap_id
message[2] = 0
message[3] = Unused
message[4] = Unused
message[5] = Unused
message[6] = Unused
message[7] = Unused

DEGAS Elite will respond with message number $DE81, formatted as follows:

message[0] = $DE81
message[1] = DEGAS Elite ap_id
message[2] = 0
message[3] = Screen buffer index
message[4] = Unused
message[5] = Unused
message[6] = Unused
message[7] = Unused

The screen buffer index is an index into the screen buffer array. If the index is 1, drawing screen #1 is in use. If the index is 11, drawing screen 7 is in use. Be sure to request the buffer addresses with the $DE00 command before using the $DE01 command so you'll be sure to have the buffer addresses handy.

Get Block Parameters.

This command allows you to find out where the current "block" image is stored, as well as how large it is. The block parameter request message is formatted as follows:

message[0] = $DE02
message[1] = Accessory ap_id
message[2] = 0
message[3] = Unused
message[4] = Unused
message[5] = Unused
message[6] = Unused
message[7] = Unused

When DEGAS Elite receives this message, it will compose and send a reply message, $DE82, as follows:

message[0] = $DE82
message[1] = DEGAS Elite ap_id
message[2] = 0
message[3] = Index of buffer where block is located
message[4] = X coordinate of upper-left corner of block
message[5] = Y coordinate of upper-left corner of block
message[6] = Width of block in pixels
message[7] = Height of block in pixels

In the current version of DEGAS Elite, the block is stored in buffer number 3, and always has its upper left corner at coordinates 0,0. This may change in future versions. If you choose to change the block, be sure you align it at the proper position in the correct buffer.

Set Block Parameters.

DEGAS Elite allows accessories to change the current block size. This would be necessary if the accessory loaded a different-sized block image into the block buffer. The command to change the block size is as follows:

message[0] = $DE03
message[1] = Accessory ap_id
message[2] = 0
message[3] = New block width
message[4] = New block height
message[5] = Unused
message[6] = Unused
message[7] = Unused

There is no reply to this message from DEGAS Elite. However, it is important that you set the block size to a setting compatible with the current screen resolution (greater than 0 and less than or equal to the screen width and height).

Changing the Color Palette.

If you are writing an accessory that loads a picture from disk and places it in one of the display buffers, you'll want to be able to set the color palette to the appropriate settings. This is done with the color palette change command, $DE04. This is a special case message, consisting of 48 bytes. It is formatted as follows:

message[0] = $DE04
message[1] = Accessory ap_id
message[2] = 32
message[3] = Image palette set flag
message[4] = Unused
message[5] = Unused
message[6] = Unused
message[7] = Unused
message[8] = Palette color 0
message[9] = Palette color 1
message[10] = Palette color 2
message[11] = Palette color 3
message[12] = Palette color 4
message[13] = Palette color 5
message[14] = Palette color 6
message[15] = Palette color 7

message[16] = Palette color 8
message[17] = Palette color 9
message[18] = Palette color 10
message[19] = Palette color 11
message[20] = Palette color 12
message[21] = Palette color 13
message[22] = Palette color 14
message[23] = Palette color 15

The first 8 words in the message is a standard-length GEM message. Note that word 2 of the message is 32, indicating that there are 32 bytes (16 words) of data following the main message. Word 3 of the message is a flag that tells DEGAS Elite whether or not it is to assign the palette to the currently selected drawing screen. If the word is 0, the palette is loaded but is not assigned to the current drawing screen. If the word is nonzero, the palette is loaded and is assigned to the current drawing screen.

If you are loading a picture with a new palette, you will want to use a nonzero value in the flag, so that the picture will have the proper colors assigned to it. If you're just changing the colors, use a zero in the flag. This will allow you to use the "remap" function to recolor the current picture to the closest match using the new palette.

When you send the color palette set command to DEGAS Elite, be sure to send a total of 48 bytes to Elite, with either a single, large message buffer (one **appl_write**) or with a normal message buffer and the palette array. Both options are shown below.

One large array:

```
appl_write(DEGAS_id,48,message);
```

Normal message buffer and palette array:

```
appl_write(DEGAS_id,16,message);
appl_write(DEGAS_id,32,palette);
```

Either way, the 48-byte message will be received properly by DEGAS Elite. You must always send the entire 16-word palette array, regardless of the resolution.

CAUTIONS

When a program such as DEGAS Elite uses a communication pipe, you should use *only* the documented message pipe commands to get information from the program. Using tricks such as disassembling the program and locating undocumented variables or buffers is a big no-no, and can only lead to disaster in the future when a new version of the program is released. Don't do it. 'Nuff said.

When an accessory takes over and must display a dialog, it is best for the accessory to open a full-screen window over DEGAS Elite's control panel. If this is not done, mouse clicks on the panel will be relayed by GEM to DEGAS, possibly messing up the display. Just be sure to close the window when your accessory is done with its work. When control returns to DEGAS (or whatever program you are working with), it will receive a full-screen redraw message, and will redraw its windows, control panels, and so on.

DEMONSTRATIONS

The DECOMM.ACC desk accessory program on your START disk is a demonstration of how to communicate with DEGAS Elite. It shows the use of all communication pipe commands and reception of replies from DEGAS. When activated, if DEGAS Elite is resident, the accessory will print out a report on your printer telling the status of Elite. It will print a list of pointers to the screen buffers, the current screen in use, and the block parameters.

You can write all sorts of interesting accessories that will work with DEGAS Elite, and Patrick Bass, START Technical Editor has done just that. Check out his accompanying article for more information and ideas.

With the communication pipe and a well-defined, well-thought-out communication protocol, your programs can be written so that they can be easily expanded in the future. It just takes a little effort when you're coding the main program. I hope you find this application for desk accessories to be as powerful as I have.

Desk accessories. They're not just RAM-wasters any more. ■

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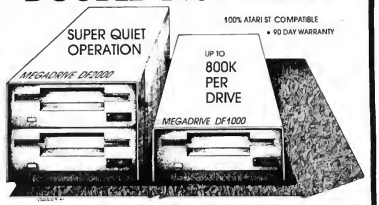

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THE MUSICAL ST

Consumer MIDI software tools and toys

BY JIM PIERSON-PERRY

Okay—so you know the difference between a sequencer and a patch editor, and your ST is ready and waiting. Now you're ready to become the new Vangelis. But before you plunk down your money, breeze through this article, and let Jim Pierson-Perry show you what what's hot and what's not in the world of consumer ST music software.

Welcome to the Atari ST MIDI software explosion! With its 16-bit architecture and built-in MIDI ports, and a price roughly equivalent to a similarly configured Commodore 128, it's no wonder industry experts view the ST as the new "musicians' computer." There are now MIDI programs available for a variety of uses ranging from a player-piano simulation (based on real piano rolls) to a professional 60-track sequencer system.

If you're new to the electronic music world, it can be a bewildering experience to fight through the jungle of new terminology just to find out what these new programs are supposed to do—let alone try to use them. In this article, we will first look at the main classes of MIDI-based software and describe the functions and features you should look for. Then we'll examine commercial ST MIDI software products and see how they compare for features and performance. ▶

Musical ST...

Although we'll be looking at software for home and hobbyist use, many of the products are equally suited for the professional musician. (Editor's note: *A separate article on professional MIDI software will appear in an upcoming issue of START.*) To use most of these products, you need only your ST and a MIDI-compatible synthesizer such as the popular Casio CZ-101, Yamaha DX-7 or Ensoniq ESQ-1. Of course, the more MIDI equipment you have (like samplers, drum boxes, and expanders) the more involved your music can be – and the more you'll appreciate having the ST to hold it all together!

KEY TO CHARTS

AT = aftertouch	M = merge tracks
C = copy	ME = measure counter
CC = MIDI controller	MK = MIDI keyboard
CD = change drive	N = note
CK = ST keyboard	PC = program change
CP = cut and paste	P = performance features only
CZa = CZ-101/1000/5000	R = rename file
CZb = CZ-1/CZ-230S	RW = rewind
D = delete file	S = segment
E = event	SW = swap
F = format disk	T = track
FF = fast forward	TM = tempo
ID = insert/delete	V = velocity

INTRADA

MIDI software comes in six types: music players, sequencers, scoring programs, patch editors, librarians, and utilities. Within each type are varying levels of features, and there is a fair degree of overlap between the types.

As I write this, there are no stand-alone consumer-level music scoring or utility programs for the ST (although by the time you receive this issue of START, some commercial packages should be in release). The programs covered here fit into the player, sequencer, and librarian, classes. An overview of the patch editors available for the ST will appear in an upcoming issue of START. In this article I have a mini-review of each program and then highlight some of their specific features in the summary charts.

The computer music/synthesizer field has its own arcane jargon, which may be daunting to the uninitiated. (For a good introduction to some of these terms, read "The Ins, Outs and Thrus of MIDI" by Tom Jeffries in *START* #4.) For the software in this review, it's important that you understand the terms *real-time*, *step-time* and *patches*. Music software with real-time functions records and/or plays your music at its normal tempo. In this sense, it serves as a tape recorder. With step-time, on the other hand, you can enter or play one step (note, beat, etc.) at a time. Many musicians use step-time to enter notes from sheet music or to get through complicated passages that would be difficult to play in real time. A patch is the collection of settings or parameters needed to create a particular sound on a synthesizer.

MUSIC PLAYER PROGRAMS

At the simplest level, a player program takes a data file containing musical information in the MIDI format and uses it to reproduce the original music on a MIDI instrument (typically a synthesizer). This is the digital equivalent of a jukebox. At higher levels comes the ability to enter musical data in step-time format along with non-music control events, such as changing the synthesizer voice or adding portamento, sustain, and vibrato. Some of these programs offer song playback through the ST's internal monitor speaker as well as external MIDI instruments. For a player program, availability of pre-recorded music on ST disks or as BBS files is important unless you only want to encode your own music.

MIDI Magic ($39.95, Micro-W Distributing, Inc.) is an example of a simple player program. It relies on pre-recorded music disks (6 songs per disk at $19.95) as the music source. It has no provision for you to create your own song files, but there are currently more than 100 music disks available. (Interestingly, the music files are digital encodings of piano rolls, in some cases originally cut by Scott Joplin, George Gershwin and Liberace.) Playback is restricted to one MIDI channel. Although MIDI Magic may sound up to 12 notes at once, even a Casio with eight-voice capability will give you good results. This was one of the first MIDI programs for the ST, and more recent software has much better performance. Given its limited capabilities, the program is too costly to recommend unless you are specifically interested in its music library.

The ST Music Box ($49.95, XLEnt Software) is a step up the performance ladder, with many new features including user entry of music and MIDI control data in step-time, score printout, and playback via MIDI or the monitor speaker. You must buy the disk version specific to your monitor (color or monochrome). With this program, you can enter music with up to eight voices over four MIDI channels, and change tempo or MIDI instrument voicings with each measure! It also has a smart note entry editor to improve the accuracy of song entry. You can use most control features via the function keys, although with no on-screen guide you must refer to the manual constantly. I found that the program has problems with error trapping and an annoyingly long response time going from the function keys to the main entry screen. Score printout is provided via a separate program, but is not of much practical use. You can either have a normal score for only a single voice or print all voices but only one measure per line. On the bright side, the authors of ST Music Box also wrote the book *Introduction To MIDI Programming* ($19.95, Abacus), which includes much source code and background for you to study.

At the top of the player software ranks is The Music Studio

($59.95, Activision). This is a very well-designed program with numerous features, including step-time song entry, four independent music tracks (each containing up to 15 different MIDI voicings), and complete score printout. Playback can be through MIDI and/or a programmable internal synthesizer that plays in three voices through the monitor speaker (you must have a color monitor to run the program). The MIDI voicing features are specifically designed for Casio synthesizers, but other brands work just as well. The pop-out menus use the mouse and are fairly self-explanatory. Over one hundred song data files are available through bulletin board systems. This program has been enthusiastically received by users and I can strongly recommend it.

The MIDIplay program ($49.95, Electronic Music Publishing House) straddles the player/sequencer boundary, and I've included it in the comparison charts for both. As a player program, it works with pre-recorded music disks (12 songs per disk at $19.95 each); 3 disks are now available, and 50 more should be released during 1987. MIDIplay can also record real-time MIDI input from 16 channels into one track. Unfortunately, it has no music editing functions. Playback can be through MIDI or a programmable internal synthesizer that plays through the monitor speaker. A nice addition is availability of instructions though the HELP button. While the program works well as specified, there are several public domain programs that are just as good for real-time recording. As a playback program alone, I find the price too high. It also needs some work on its mouse functions, which are occasionally unreliable.

SEQUENCER PROGRAMS

Sequencer programs are the next step beyond player programs. The simplest sequencers record real-time input of MIDI music and controller data; more complex versions allow for sophisticated editing and manipulation of the music and can hold up to 60 independent tracks. A sequencer is like a multi-track tape recorder and, in fact, most such programs use a tape recorder metaphor in the user interface.

A good sequencer program lets you edit music data much the same as you would edit text with a word processor, inserting or deleting passages and cutting and pasting repeated sections. A MIDI thru feature is important too, especially if you are using a remote master keyboard controller. You also need external synching if the song tempo is to be controlled by a drum machine. Depending on the MIDI controllers used, some instruments may send too much information and clog the data stream. Data filtering can selectively remove unwanted data and eliminate this problem. Other useful features are time correction (to synch the real-time notes played with the desired time signature), monitor metronome to keep steady time while playing, and punch in/out to overdub and correct bad notes. ▶

PLAYER COMPARISON CHART

	MUSIC BOX	MUSIC STUDIO	MIDIPLAY	MIDI MAGIC
GENERAL FEATURES				
Version reviewed	1.1	—	v425	—
Cost	$49.95	$59.95	$49.95	$49.95
# trocks	8	4	1	1
# simultoneous voices	8	15	16	16
Need TOS in ROM	yes	no	no	no
Copy protected	no	yes	yes	no
Input sources	CK	CK,MK	MK,PD	MK,PD
Monitor resolution	med/high	low	med/high	low
SET-UP				
MIDI/monitor output	yes/yes	yes/yes	yes/yes	yes/no
Assign MIDI voicings	yes	yes	no	no
Assign MIDI effects	some	no	no	no
Programmoble int synth	no	yes	yes	no
Free memory indicator	yes	yes	no	NA
DATA INPUT				
Reol time data recorded	no	no	oll	NA
Step time data recorded	N,PC,TM	N	no	NA
# time signatures	4	8	NA	NA
Smart meosure entry	yes	no	NA	NA
MIDI note ronge	24-83	0-120	0-127	0-127
Note timing resolution	1/32	1/32	NA	NA
EDITING FUNCTIONS				
File edit options	no	F,D,R	no	no
Segment edit options	CP,I,D	CP,I,D	CP	NA
Transpose/octave range	yes/2	yes/5	yes/1	no
Duretion scaling	no	yes	no	NA
Add lyrics/song title	no/no	yes/yes	no	NA
PLAYBACK				
Vory tempo	yes	yes	yes	yes
Set cue point	yes	yes	yes	no
Play selected trocks	yes	yes	NA	NA
Medley ploy	no	no	yes	yes
Music disks cost	NA	NA	$19.95	$19.95
BBS song files	few	mony	NA	NA
SCORING				
Single voice score	yes	yes	no	no
Sheet music score	limited	yes	no	no
Add enhoncements	text,pic	no	NA	NA
OVERALL IMPRESSIONS (0-5)				
Eose of use	3	5	4	5
Progrom feotures	4	5	3	2
Documentotion complete	4	5	4	4
Documentotion clear	4	5	5	5

Musical ST...

SEQUENCER COMPARISON CHART

	EZ-TRACK	MIDIPLAY	MIDI REC STUDIO	MIDISOFT STUDIO	SUPER CONDUCTOR
GENERAL FEATURES					
Version reviewed	1.0	425	1.0	2.10	1.3
Cost ($)	65.00	49.95	39.00	99.00	69.00
# Tracks	20	1	8	32	16
Event capacity (520ST)	27,000	250,000	?	30,000	?
Need TOS in ROM	yes	no	yes	yes	yes
Copy protected	no	yes	yes	no	no
GEM utilizotion	full	no	some	full	full
Allow desk accessories	yes	no	no	yes	yes
Keyboord mouse equiv.	P	oll	P	P	some
SET-UP					
MIDI system commonds	no	no	yes	yes	yes
Set instrument modes	yes	no	no	yes	na
MIDI slow option	na	na	yes	yes	no
Sync to external device	na	no	yes	yes	no
Sang pointer	no	no	na	yes	yes
Beots/measure range	NA	NA	1-999	1-16	1-99
Tempo (beats/min)	1-480	?	10-999	12-480	40-213
Metronone	a/v	na	a/v	a	a/v
Free memory indicator	yes	yes	no	yes	yes
Formot data disk	yes	no	na	na	no
DATA ENTRY					
Count-in	no	no	yes	yes	yes
MIDI channels/track	1	1-16	1-16	1	1
Set cue point	na	no	yes	yes	yes
Punch in/out	no	no	no	yes	na
Dato recarded: RT	all	all	oll	all	all
Data recorded: ST	oll	no	all	N,V,PC	oll
Filtering	no	na	CC,AT	AT	oll
MIDI thru	yes	no	yes	yes	yes
Track name length	16	8	8	24	NA
Track protect	yes	no	no	yes	no
Mute/sala	y/y	n/n	y/n	y/y	y/y
Playback modes	RT,ST	RT	RT,ST	RT,ST	RT
EDITING					
Edit modes	T,S	no	T,S,E	T,S,E	S,E
Trock manipulatians	C,M	no	C,M,D,R	C,M,D,R	no
Transpose track/octaves	yes/4	yes/1	yes/5	yes/5	yes/8
Segment locaters	FF,ME	marker	ev list	FF, RW,ME	block
Segment monipulatians	no	CP	CP,ID	CP,ID	C,M,D, ID,split
Parameter scaling	no	no	all	na	no
Event manipulatians	no	na	all	N,PC	all
Time correct lacatian	yes	no	yes	yes	yes
Time correct duration	no	no	yes	yes	yes
Event hardcopy	na	na	yes	na	yes
OVERALL IMPRESSIONS (0-5)					
Eose af use	4	3	3	5	3
Progrom features	3	1	5	4	5
Documentation complete	4	5	4	5	4
Documentatian clarity	5	5	4	5	3
Professional use?	no	no	yes	yes	yes

EZ-Track ($65.00, Hybrid Arts) represents the entry level for usable sequencers. This is a very workable 20-track tape recorder emulator. EZ-Track provides MIDI thru along with a track merge option; however, each track can only play on a single MIDI channel. You can do transposing, but only for the entire song rather than for individual tracks (one track can be specified to be left unchanged, typically for drum machine data). This program makes no provision for editing segments within a track. One annoying point is that it won't automatically save your recordings; you must explicitly save each recording or it is lost.

An excellent home sequencer is the MIDIsoft Studio ($99.00, MIDIsoft Corporation; also distributed by Passport). This upgraded version of MIDIsoft's Metatracks program has substantially more features, including 32 recording/editing tracks with a variety of data editing options. (Editor's note: *A review of MIDIsoft Studio appears in the July issue of Antic's ST Resource.*) The program allows MIDI thru with filtering of aftertouch data. It's extremely easy to use and has well-written documentation. There's full support of GEM, including desk accessories, along with synch to external devices and various MIDI system commands. MIDIsoft Studio supports count-in (starting free measures with a metronome) to give you a feel for the music tempo before you start to play. You could use this program for professional work with no apologies. Be sure to get the most recent version (2.10), which includes the MIDI thru function and step-time editing.

The MIDI Recording Studio ($39.00, Dr. T) is an entry-level sequencer program (as opposed to the professional-level program from Dr. T, the Keyboard Controlled Sequencer, $195.00). MIDI Recording Studio supports Dr. T's well-deserved reputation for software that enhances the music cre-

ation process. Its many unique editing features make it the most powerful of those I looked at—and for the lowest cost! The program is built around a MIDI event table containing all notes and controller changes that occur during recording. You can edit this table event by event, or apply an operation (such as velocity change) to a selected range of events. MIDI Recording Studio is the only sequencer I tested that allows parameter scaling. One application of this is to automatically ramp up/down note velocity over a music passage to create fade in/out effects.

The whole setup is similar to a music data spreadsheet and it is enormously powerful. My only complaint is that it is not fully GEM-based; you'll have to spend some time before you'll be comfortable with the program, but anyone interested in home recording should try it.

Super Conductor ($79.95, MichTron) is the most recent addition to the ranks of economical sequencer programs. Its operation is more similar to that of professional level sequencers than to a tape recorder emulator. To use it, you record a section of music (simple fragment or entire song) which is saved as a block. You can then arrange these blocks in any desired order across the 16 MIDI channels, and edit music data within a block using the powerful event list approach. Super Conductor also allows for extensive filtering of note and/or controller data either during or post-recording.

This block structure formatting is particularly useful if your song makes use of looping or repeat segments. You can copy a block multiple times, edit it to include variations in tone and dynamics, and play it back simultaneously across multiple MIDI channels . The three internal (monitor) voices are provided as if you have three additional MIDI channels; you can use these to test-play blocks or as supplemental voices. It also has a provision to send and receive system exclusive data files, although this feature is not set up for novice MIDI users.

In adopting the block music structure, a potential drawback is that you may find Super Conductor requires too much effort for casual use. During recording, all channel identification is stripped from incoming data to facilitate block editing and relocation. This prevents simple record and playback; especially simultaneous input from multiple channels, such as synths and a drum machine. For those who are willing to spend some time and want something beyond a MIDI tape recorder, Super Conductor is recommended as an alternative type of sequencer, which is especially good for realizing complex musical ideas.

LIBRARIAN *PROGRAMS*

A library management program is a repository for MIDI data; it can be either free standing or integrated within patch editor software. In this section, I'll only look at free-standing programs. A librarian stores the control parameter data to initialize synthesizer voicings, set drum machine patterns, and assign controller effects. Librarians can build composite files that contain system-exclusive data for each instrument to give the desired setup for a particular song. All you need to do is call up the appropriate file; with the press of a button you're ready to play. This makes a good librarian program indispensable for a MIDI-based system in live performance.

Equipment that adheres to the MIDI 1.0 specification usually can be accessed by a generic librarian, rather than requiring a separate program for each instrument. Two notable exceptions are the Casio synthesizer line and Roland drum machines, both of which use nonstandard handshaking ▶

LIBRARIAN COMPARISON CHART

	SYS/EX	DATA DUMPSTOR	TR707 DUMPSTOR	PRO-CREATOR
GENERAL FEATURES				
Version reviewed	2.0	1.1	1.0	1.0
Cost ($)	150.00	89.95	64.95	240.00
Need TOS in ROM	no	no	no	yes
Copy protected	yes	yes	yes	chip
GEM utilization	no	full	full	full
Allow desk accessories	no	yes	yes	yes
Mouse bosed	no	yes	yes	yes
Desk accessory version	no	yes	yes	no
SET-UP				
Instruments supported	MIDI 1.0	MIDI 1.0	TR707/727	DX-7/TX
Hord drive supported	yes	yes	no	no
Free memory indicotor	yes	yes	NA	NA
MIDI slow option	built-in	yes	NA	no
Support folders	no	yes	yes	no
# MIDI doto files disployed	1	20	20	2
REQUEST/MIDI FILE FUNCTIONS				
Request files on disk	no	yes	NA	yes
MIDI doto buffer size	350K	310K	NA	NA
Smart "buffer full" recovery	yes	no	no	NA
Creote composite MIDI files	yes	yes	NA	NA
Request looping option	yes	yes	NA	NA
File edit options	C,D	D,F	D,F	D
Nome individuol trocks	NA	NA	yes	NA
OVERALL IMPRESSIONS (0-5)				
Eose of use	4	5	5	4
Progrom feotures	4	5	4	3
Documentotion completeness	5	5	5	3
Documentotion clority	5	5	5	4
Suitable for professionol	yes	yes	yes	no

Musical ST...

PUBLIC DOMAIN MIDI SOFTWARE AND SOURCES

For those of you with a modem, there is a lot of MIDI software in the public domain that is definitely worth acquiring. It's also an easy way to try out some music software to get a taste of what the ST/MIDI connection can offer. Listed below are some of the better picks, followed by a couple of BBS systems for you to look into for programs and general MIDI-related information.

SOFTWARE

MIDIDEMO.PRG—a music player program with a piano screen display that shows the notes highlighted as played; comes with 7 pre-recorded song files.

CASIO.TOS—a voice librarian for the Casio CZ-101/1000; comes with a collection of patches.

CZPATCH.PRG—a patch generator program with user-definable limits on a "weirdness" factor; I liked it better than CZ-Android for coming up with interesting new sounds. You'll play with this one all night.

MIDIMIKE.PRG—a one-track sequencer program that comes with several song files; very good and better than some commercial programs.

MUSIC STUDIO .SNG FILES—more than 100 song files are available with new ones added weekly.

MIDI-RELATED BBS

MIDI WORLD NETWORK (213/826-4288)—run by Hybrid Arts but contains information for all MIDI equipment and computers.

TACE (817/778-2506)—contains many MUSIC STUDIO song files and a collection of EZ-Track song files.

GALACTIC IMPERIUM (718/851-5785)—good source for MIDI demo programs and music files; ST specific bulletin board.

MIDWEST MIDI BBS (405/733-3102)—home base for the International Electronic Musicians Users Group; contains a tremendous amount of MIDI information and patch data for various instruments and computers; good source of industry news.

In addition to these, there are also many files of interest on COMPUSERVE in both the Atari SIG and the Music Forum SIG.

specifications for system exclusive data transfer and need specialized software.

SYS/EX ($150.00, Key Clique) is a generic librarian program that has been out for other computers for some time and has now been ported to the ST. It's designed especially for use by performing musicians; since it's hard to find enough room for a mouse with an on-stage setup, the program uses keyboard menus rather than mouse-based input. You must create a short command file to request the parameter data for each instrument; once it's made, you can save the command file to disk for subsequent use. After calling the desired command programs, one after another, it dumps each instrument's data into a composite MIDI file. By calling up the MIDI file at a later time, it can reset all instruments to their previous states. SYS/EX includes a manual supplement that gives the necessary command sequences for many instruments. However, this program will not work with Casio synthesizers due to Casio's nonstandard protocol. (Editor's note: *Those of you who own a Casio synthesizer should take a look at Tom Bajoras's "MIDISAVE" in this issue of START. MIDISAVE is a simple patch librarian which works with many synthesizers, including the Casio.*) Despite the lack of frills and a somewhat expensive price, this is a dependable program; I've given it a lot of field testing and can readily recommend it.

The Data Dumpstor ST ($89.95, Music Service Software) is a similar program but with a full GEM implementation. It can hold up to 20 independent MIDI data files in memory, and comes with command files already on disk for many common MIDI instruments; you can create and store additional command files as needed. One very useful feature is the MIDI file send subprogram that works as a separate desk accessory. This allows instrument setup within other GEM-based programs such as sequencers, and is an excellent innovation that I hope other MIDI software will incorporate. This program performs very well and is extremely easy to learn and use, particularly for a home studio. Like SYS/EX, though, it won't work with Casio synthesizers.

The TR707 Dumpstor ST ($64.95, Music Service Software) is specifically designed to deal with the nonstandard protocol used by the popular Roland TR707/727 drum machines. It's essentially a specialized version of the Data Dumpstor ST with similar features and performance. It can accommodate 20 full dumps (four tracks each) from the TR707 in memory and allows you to name each individual track, if desired. There's also a desk accessory version for file uploading to the drum machine. The only commercial ST program now available that can work with the TR707, this program is much cheaper than using the TR707's ROM cartridges and better than cassettes for storing your drum patterns.

The Pro-Creator ($240.00, Steinberg Research, distributed by the Russ Jones Marketing Group) is an unusual program. It is primarily a random patch creator for the Yamaha DX-7/TX

series combined with a patch librarian. It is not a patch editor. You can have it create totally new patches or make up variations on a set of existing patches. Only two patch banks are kept in memory at a time, which can be a hinderance when relocating patches to come up with new banks. It uses a hardware circuit board key for copy protection; it must be inserted into the cartridge slot for the program to boot. Keeping it in place does not seem to interfere with other ST software.

Overall, I am not impressed with this program. The patch generator is an amusing toy, but not of much practical use without being able to edit and fine-tune the patch parameters. Pro–Creator is only barely acceptable as a librarian due to the two bank limitation and inability to address disk drives other than A.

(Editor's note: *In the Spring, 1987 issue of START, the Pro–Creator was incorrectly listed as a sequencer. Also, the zip code for the Russ Jones Marketing Group was incomplete. The correct address is at the end of this article.*)

THE CHARTS

The accompanying charts compare the features of all these programs side by side. There's a separate chart for each type of software: players, sequencers, and librarians. Whenever possible I have tested and verified the features myself, rather than just listing the manufacturers' claims.

COMING ATTRACTIONS

A whole new group of MIDI programs are nearing completion; by the time you read this article, many of them should be available. Below I have listed some of the software that should be brought to market soon.

- EZ-Score ST (Hybrid Arts): scoring program compatible with EZ-Track ST music files
- FB-01 Editor/Librarian (Music Service Software): patch editor for FB-01
- Four Patch + (Aegix): patch editor for Yamaha 4 operator synthesizers
- MIDI-Edit (Electronic Music Publishing House): upgraded version of MIDIplay to include step-time music entry and additional editing features
- MIDIsoft Enhanced Studio (MIDIsoft Corporation): advanced version of MIDIsoft Studio
- Samplemaker (Virtual Sounds Software): computer generation of digital samples for Sequential Prophet 2000/2002, Akai S900, and Ensoniq Mirage samplers
- Soundfiler S612 (Drumware): librarian/visual editing system for the Akai S612 sampler
- XTRACK, XNOTES, XSYN (Beam Team): modular, integrated software for sequencing, scoring, and patch editor for Casio CZ, Yamaha DX, and Roland JX synthesizers

CODA

Whether your interests are in music education, listening to a home jukebox, running a home music studio or just fooling around, there's ST MIDI for you. Sergeant Tramiel's Lonely Hearts Club Band is sitting inside your computer, just waiting to take you away! ■

IF YOU'D LIKE TO SEE MORE ARTICLES LIKE THIS ONE, CIRCLE 186 ON THE READER SERVICE CARD.

REFERENCES

- "The Ins, Outs, And Thrus Of MIDI" by Tom Jeffries, START, Spring 1987.

- *MIDI For Musicians*. $14.95 Craig Anderton, AMSCO Music Publications, 24 E. 22nd St. New York, NY 10010 1986. (212) 254-2100

CIRCLE 187 ON READER SERVICE CARD

- Keyboard Magazine (see especially the synthesizer glossary in the February and March 1987 issues), 20085 Stevens Creek, Cupertino, CA 95014, (408) 446-1105.

CIRCLE 188 ON READER SERVICE CARD

- Electronic Musician Magazine (a TR707 librarian program for the ST was in the February 1987 issue), 2608 Ninth St., Berkeley, CA 94710.

CIRCLE 189 ON READER SERVICE CARD

- *Introduction to MIDI Programming*. Abacus Software, Inc., P.O. Box 7219, Grand Rapids, MI 49510. (616) 241-5510.

CIRCLE 190 ON READER SERVICE CARD

LIST OF MANUFACTURERS

- The Music Studio
  Activision, Inc.
  2350 Bayshore Parkway
  Mountain View, CA 94039
  (415) 960-0410

CIRCLE 191 ON READER SERVICE CARD

- Four Patch +
  Aegix
  P.O. Box 9488
  Reno, NV 89507
  (702) 329-1943

CIRCLE 193 ON READER SERVICE CARD

Musical ST...

- XTRACK, XNOTES, XSYN
  Beam Team
  6100 Adeline Street
  Oakland, CA 94608
  (415) 658-3208

CIRCLE 194, 195, 196 ON READER SERVICE CARD

- MIDI Recording Studio,
  Keyboard Controlled Sequencer
  Dr. T's Music Software
  66 Louise Road
  Chestnut Hill, MA 02167
  (617) 244-6954

CIRCLE 197, 299 ON READER SERVICE CARD

- Soundfiler S612
  Drumware
  12077 Wilshire Blvd., #515
  Los Angeles, CA 90025
  (213) 478-3956

CIRCLE 201 ON READER SERVICE CARD

- MIDIplay, MIDI-Edit
  Electronic Music
  Publishing House, Inc.
  2210 Wilshire Blvd., Suite 488
  Santa Monica, CA 90403
  (213) 455-2025

CIRCLE 202, 203 ON READER SERVICE CARD

- EZ-Track, EZ Score ST
  Hybrid Arts, Inc.
  11920 West Olympic Blvd.
  Los Angeles, CA 90064
  (213) 826-3777

CIRCLE 204, 205 ON READER SERVICE CARD

- SYS-EX
  Key Clique, Inc.
  3960 Laurel Canyon Blvd., Suite 374
  Studio City, CA 91604
  (818) 905-9136

CIRCLE 207 ON READER SERVICE CARD

- Super Conductor
  MichTron
  576 S. Telegraph
  Pontic, MI 48053
  (313) 334-5700

CIRCLE 208 ON READER SERVICE CARD

- MIDI Magic
  Micro-W Distributing, Inc.
  1342B Route 23
  Butler, NJ 07405
  (201) 838-9027

CIRCLE 209 ON READER SERVICE CARD

- MIDIsoft Studio,
  MIDIsoft Enhanced Studio
  MIDIsoft Corporation
  P. O. Box 1000
  Bellevue, WA 98009
  (206) 827-0750

CIRCLE 210, 211 ON READER SERVICE CARD

- Data Dumpstor ST, TR707 Dumpstor,
  FB-01 Editor/Librarian
  Music Service Software
  801 Wheeler Road
  Madison, WI 53704
  (608) 241-5615

CIRCLE 212, 213, 214 ON READER SERVICE CARD

- MIDIsoft Studio
  Passport
  625 Miramontes Street
  Half Moon Bay, CA 94019
  (415) 726-0280

CIRCLE 215 ON READER SERVICE CARD

- Pro-Creator
  Steinberg Research
  Distributed by:
  Russ Jones Marketing Group
  17700 Raymer St., Suite 1001
  Northridge, CA 91325
  (818) 993-4091

CIRCLE 216 ON READER SERVICE CARD

- Samplemaker
  Virtual Sounds Software
  557 Tremont, Suite 11
  Boston, MA 02118
  (617) 353-1815

CIRCLE 217 ON READER SERVICE CARD

- ST Music Box
  XLEnt Software
  P. O. Box 5228
  Springfield, VA 22150
  (703) 644-8881

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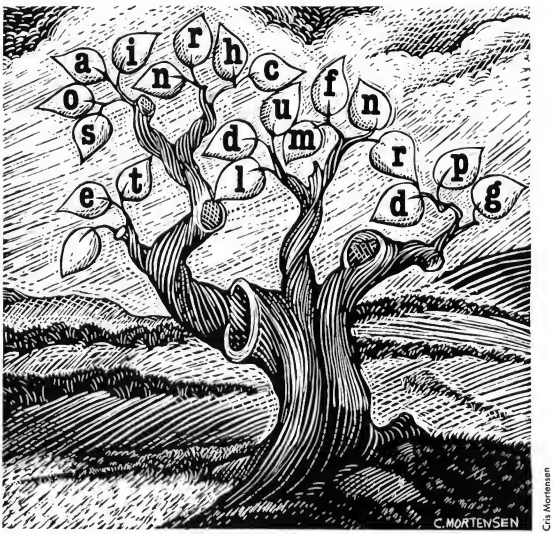
PACKTEXT

TEXT COMPRESSION AND HUFFMAN CODING WITH PERSONAL PASCAL

by Daniel Matejka

A completely GEM-based compression program for compacting text files; includes a lucid introduction to information theory, Huffman encoding, the ASCII character set, and tree structures. You can find the compression program and the voluminously commented source code on your START disk.



Cris Mortensen

File PACKTEXT.ARC on your START disk

In the 1940's, Claude E. Shannon of the Bell Technical laboratories devised a set of theorems which sprouted a new branch of science called *information theory*. Shannon's work showed, among other things, that many messages are *redundant*; they contain more information than is really needed. Once redundant patterns are recognized, they can be encoded more efficiently.

PACKTEXT is a file compressor and decompressor. It strives to remove much of the redundancy within a text file. It can pack large files into considerably less space without loss of data. It will also, handily, read its own packed files and return them to their original form. While designed specifically for use with ASCII text, it will work on any data, though it may actually create larger files.

This technique is widely useful and can be directly incorporated into other applications. For example, a RAM-based database could use packed data, unpacking only one record at a time for display or processing, and expand its capacity by perhaps 40% before tackling the complications of going to a disk-based system. This technique could also be the basis for a data encryption scheme, since it isn't immediately obvious what the original text looked like.

THE CONCEPT

Most micros use the ASCII character set to save, transmit, and otherwise manipulate text. The standard ASCII set contains 95 unique characters: 26 uppercase letters, 26 lowercase, 10 digits, the space, plus 32 punctuation marks and other symbols of dubious usefulness. The computer represents each character as a unique binary code, and 95 distinct symbols of any type require at least seven bits to encode ($2^6 < 95 <= 2^7$). Notice that the only correlation between any seven bit code and the character it is intended to represent is a matter of interpretation. A pattern of seven bits could just as easily be the beginning of a color palette, part of a DEGAS picture, or just random gibberish. The whole idea behind ASCII was to invent 95 different bit patterns, assign some meaning to each, and attempt to make the whole thing appear as if it were conceived by a guiding intelligence.

There's nothing really sacred about "01100101" after all.

The Atari ST is constructed so the smallest addressable unit of memory is the byte: eight consecutive bits. If you only want seven bits, you'll have to access the whole byte and pick out the ones of actual interest once they're all inside the CPU.

Since the smallest convenient chunk of addressable memory (eight bits) is only barely larger than the smallest chunk necessary to encode an individual ASCII character (seven bits), it makes sense to represent a character with eight bits instead of seven. Eight bits allow $2^8=256$ distinct patterns to be represented, so 256 different characters are representable in such a character set. The standard ASCII set defines the first 7 bits worth: the 95 so-called "printable" characters plus 33 control characters (whose exact meaning is often questionable) for a total of 128. Since we have an unused bit, many computers define an additional 128 of their own to fill out the remaining space.

In a text file, for example, each separate character is encoded by the ASCII pattern lurking in a byte of memory somewhere—one pattern to a byte. The hardware and software that scans memory, finds a byte of some value, recognizes it as printable character, and then rearranges the pixels on the screen to look like that character, is something else entirely. It is only a matter of convention that the bit pattern "01100101" looks like an "e" on a screen or printer.

MAKING IT SMALLER

Compression depends on finding a more space-efficient method of representing data. Different techniques work on different types of data. If it's ASCII text compression, we want to find some sort of encoding method in which, on the whole, less than eight bits are required to represent each individual character. There's nothing really sacred about "01100101," after all.

If you were to analyze a large body of text (this magazine, for example) a pattern would emerge. Some letters appear more often than others, and some might not appear at all. In the English language, the letter "e" is the most common. Generally, about 13% of all letters in a "typical" English text will be "e." "e" is followed in frequency of use by "t," at about 10%, "a," at about 8%, and then about 23 others, down to "z," at less than 0.1%. PACKTEXT takes advantage of this *frequency distribution*.

As mentioned before, in ASCII text files, all characters are encoded as a sequence of eight bits. This is just a function of the design of the character set, and a matter of convenience. If fewer than eight bits were used per character, the result would of course be a shortened file. In fact, since the "printable" ASCII characters are all contained within the first 128 members of the set, a "printable" ASCII file can immediately be shortened 12% by simply lopping off the high bit and packing the remaining seven together. ▶

HUFFMAN CODES

Consider a system using fewer than eight and even fewer than seven bits to represent each of the characters of the ASCII set. Only an unforgivably small subset of the ASCII set can be contained in a scheme using only three or four bits per character, but consider a system in which not all characters use the same number of bits, where some are represented by as few as three or four, and others by as many as 14 or 15.

Huffman Codes use the smallest number of bits practical for commonly occurring characters and necessarily more bits for the less common ones. These unevenly sized codes can then be glommed together, disregarding simple matters of convenience like bit boundaries.

How can we determine how many bits to use for each character? And, how can we construct the table of packing codes so that it will be clear where the border lies between separate characters? Both problems are nontrivial. If we can accomplish them, and the text to be compressed cooperates by being something more than purely random gibberish, as often happens with useful information, a practical data compression scheme emerges.

The second problem is the easier of the two. In fact, it may be trivial. The delineation of codes is accomplished by constructing the table so that no packing code begins with a sequence of bits that is the same as a shorter code. For example, if the code for "e," the most common letter and therefore the owner of the shortest code, is three bits, say "000," then no code for any other letter can begin with the same sequence "000." Other, longer codes can *contain* that sequence, but to ensure each unique character has a unique, recognizable pattern in the packed bit stream, none can *begin with it*.

If "t," for example, was encoded as "0001," it would be unclear if that pattern meant "t", or "e" followed by the beginning of something else. Perhaps the decoding algorithm could be clever enough to know the difference. PACKTEXT certainly isn't. However, if "t" was encoded as "10001," even though it contains the sequence "000" (which could mean "e"), by the time the decoding algorithm gets that far it should realize it isn't an "e." All we need to know is where the character begins in the packed bitstream and that the opening sequence of each character is unique.

FIGURE 1

Character (packing) Code	Frequency of Occurrence	Huffman
blank	17.9%	00
e	9.5%	010
t	7.4%	011
s	5.5%	10000
o	5.5%	10001
a	5.5%	10010
i	5.1%	10011
n	4.7%	10100
r	4.5%	10101
h	3.5%	10110
c	3.2%	10111
l	3.1%	11000
d	2.4%	110010
u	2.1%	110011
m	1.8%	110100
f	1.7%	110101
Carriage Return	1.7%	110110
Line Feed	1.6%	110111
b	1.6%	111000
p	1.5%	111001
g	1.2%	1110100

This is where the trick in determining just how many bits to use for each packing code comes in. If "e" is encoded as just mentioned, then all the other seven possible combinations of three bits are available as starting sequences for other characters. If less common characters are encoded with more bits and don't begin with the sequence "000," then additional characters can be accommodated. If instead the next most common character, probably "t," is also encoded in three bits, perhaps "001," then, even if the jump to four bits is made immediately afterward, we are only left with room for twelve more unique starting codes (0100–1111). The trick is to determine the optimum length for the shortest packing code, and when to make the jump to longer codes for subsequent less common characters. Our hope is that the more common characters are common enough so that the less common ones (which will no doubt require more than the original eight bits to represent), won't weigh down the entire scheme and actually produce a longer packed file.

A well-constructed Huffman Code for "typical English text," consisting of all capital letters and nothing else, will require an average of about 4 bits per character, thereby shortening the entire text file by nearly 50%. A similarly well-constructed code for text such as this article, which includes characters of both upper case, lower case, and punctuation marks, will require about 5 bits per character: a 35% savings. "Average bits per character" refers to the length of each character code weighted by its frequency of use; it is indicative of the total length of a packed text file. Specifically, it is the sum of the products of the normalized frequency of occurrence of each character and its corresponding code length.

A CLOSER LOOK

As an example of a Huffman Code, an analysis of an early version of this article yielded the table of packing codes in *Figure 1*, truncated at the point where Frequency of Occurrence drops below 1%. Packing efficiency was better than 40%, with the average character requiring about 4.5 bits to encode.

Two things jump out from this table. First, carriage returns apparently outnumber linefeeds. This I attribute to roundoff error. Second, the Huffman Codes illustrate that no code begins with a bit sequence which duplicates a shorter code.

GENERATING UNIQUE CODES

If, before constructing the actual codes, the desired length of each code is already known, and the table is constructed in order from shortest code to longest, then each code is just the previous code +1, shifted left if it is longer. "e," for instance, is "010." The next character, "t," is "e" +1, or "011." The next character, "s," is "t" +1, or "100," except that at this point we want to begin using five bits instead of three, so enough zeroes are tacked on to the end to make up the difference with "10000." The first **n** bits in a code, where **n** is the number of bits used by the immediately preceding code (and is less than or equal to the number of bits in the current code) must be unique. The following bits, if any, can be anything at all, but zeroes are always used here because that allows the simple operation of adding 1 to get the subsequent code.

The trick is to determine the optimum length for the shortest packing code.

We need not begin with 0; we could instead begin at the other end with 2, −1, or anywhere in between. The problem with beginning anywhere in between is just remembering which patterns have already been used, and not reuse them while casting about for the next unique sequence. If we begin at one of the ends, then the simple task of incrementing (or decementing) by one each time guarantees a unique pattern.

With such a scheme, as long as the addition of 1 to the previous code never causes a carry, or *overflow*, into more bits than were expected, then no code will ever have another shorter code as its opening sequence. An overflow occurs when *n* bits, all 1's, are incremented. The result is a 1 followed by *n* 0's, which contains as its opening sequence a bit pattern already used. The bottleneck in this process is actually determining how long each code should be; where to jump to a longer code early enough to prevent pattern repetition (overflow) but late enough to avoid an unnecessarily long average code length.

DETERMINING OPTIMUM CODE LENGTH

Directly stated, the optimum number of bits **b** necessary to encode a character with a normalized probability of occurrence **p** is given by:

$$b = -\log_2 p$$

As an example, the table we looked at earlier shows that the most common character, the blank, makes up 17.9% of the file. It would optimally be encoded, then, with $-\log_2 0.179 = 2.5$ bits. Because rounding down would cause the overflow problem mentioned above, we can round up instead to get blank encoded in 3 bits. Notice, however, that in the above table it is actually encoded in 2 bits. PACKTEXT determines the length of each code should be by starting with **ceil**$(-\log_2 p)$ bits as an approximation, then attempts to use less and see how much can be gotten away with. A dash of brute force always helps any recipe.

I won't attempt to derive the formula for **b** because I'm not certain I can. Rather, I present a few scenarios designed to make it more palatable. Consider a case in which only eight characters need to be packed, and they all occur with equal frequency. Each character would have a normalized probability of occurrence of 12.5%, so each character should be encoded with $-\log_2 0.125$ = exactly three bits. Funny that exactly eight combinations are available using exactly three bits. Drop a few probabilities, thereby increasing some others, and the equation moves around in a suitably accommodating direction.

If only seven characters of all equal probability were being packed, the formula suggests 2.81 bits apiece. $2^{2.81} = 7$. Too bad. We must use an integral number of bits, so PACKTEXT would begin with all seven using three bits, then drop the first one to two just because it can.

UNPACKING

The only remaining problem is inventing a decent algorithm for unpacking the packed text. PACKTEXT traverses a binary tree to accomplish this feat. *Figure 2* shows an unpack tree corresponding to the table in *Figure 1*.

To traverse this tree and find the surprise character at the end, begin with the root node and the most significant bit. At each node take the left branch for a 0 and the right for a 1. For example, given the bit sequence "10110101," begin with the top node and take the right branch. From there, take the left. Take the right from there, the right from there, and the left from there, and that was an "h." The following bits, "101," must be the beginning of another character.

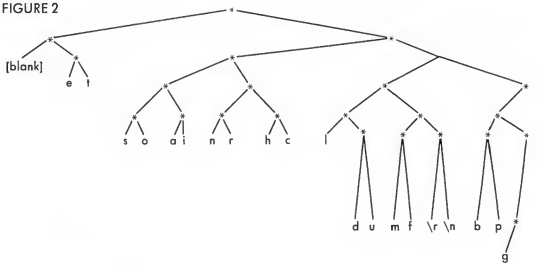
The bottleneck is determining how long each code should be.

The shortcoming of the incrementing ▶

technique used by PACKTEXT to determine unique codes now becomes apparent. It produces a severely imbalanced unpack tree. With only a few branches on the left of the root node, there are hundreds to the right. This means that the average number of nodes which must be visited to decode a character is higher than it could be, and, subsequently, it takes a little longer and uses a little more computer time to unpack than it might.

This unhappy nuance is balanced by the fact that the scarce branches to the left correspond to the most commonly used characters and are therefore more heavily traveled than the lengthier paths to the right. Regardless, the time required to traverse this tree for each character in the packed bitstream is easily overshadowed by the time required to read and write the disk files themselves.

FIGURE 2



The only remaining problem is inventing a decent algorithm for unpacking the packed text.

PROGRAM OPERATION

PACKTEXT is useful for compressing and restoring ASCII text files and possibly any data file in which data is stored by bytes. It would theoretically be of little use compressing files which aren't arranged by the byte, such as picture files. Nevertheless, for some reason, PACKTEXT seems able to compress most pictures, regardless of the theory which guided the program's inception. The DEGAS picture "COMET," a very nice medium-resolution picture on my copy of the distribution disk, is packed to 55% of its original size, including the custom 1K code table. The source listing for PACKTEXT, a file of the type the program was designed to handle, is itself only packed to 68% of its original size. For that matter, the program file PACKTEXT.PRG, as random a collection of gibberish as any (although 25% zeroes) shrunk to 80% of its original size when presented to its own mercies. Strange how things work out, sometimes.

PACKTEXT can also be used for experimenting with Huffman Codes, and performing some character analysis on text files.

Packed files may or may not contain the Huffman Code Table which was used to pack them. You can analyze just one large, representative text file and store the resulting code table for use with all text files. On the other hand, a user can analyze each file to be packed and store the code table used for that file along with the packed text itself. A more efficient packing would probably be achieved using the last method, but 1K will be lost to the table. You choose.

To create a file which is just a code table stored on disk for later use, select "Generate Huffman Codes" from the "Codes" menu. The program will prompt for the name of a text file to analyze. Once that process is finished, select "Save Huffman Codes" from the "File" menu. Once again, a name is prompted for. This creates a 1K file which you can reload for later use at any time.

To use such a code table, select "Load Huffman Codes" from the "File" menu; then select "Includes Codes in File," which will deactivate that item (which wakes up activated and checked in the menu). Now any file that is packed or unpacked will use that code table and will not include it in the packed file itself.

To pack files using tailored code tables, and this is the recommended method, first make certain "Include Codes in File" under the "File" menu is checked. Select "Pack a File" from under the "File" menu. PACKTEXT will prompt for the name of the file to be packed, and the name of a file to be created, then will build the code table and pack the file.

To unpack such a file, just select "Unpack a File" from the "File" menu. Whether or not "Include Codes in File" is checked, the code table from that file will be loaded and used to unpack it. Once again, the name of the packed file and a name for the newly created unpacked file will need to be entered.

Note: If a Huffman Code Table is stored in the packed file, the entire table (1K) is stored, not just the first part that contains the characters actually used. This would seem a waste since the entire object behind the program is to save disk space. It is nevertheless done this

way because using a truncated code table on text, other than the specific text it applies to, can cause much grief if the other text includes characters not allowed for in the table. Since the code table from the packed file is retained until replaced by some other table, it's possible to do just that.

Source code is included, so anyone who wishes can fix this minor shortcoming. In doing so, the basic operation of the program will need to be changed somewhat.

PACKTEXT maintains three individual windows for display of interesting data and obtains all its instructions through a GEM menu bar. Available commands are:

- Analyze a text file to create a Huffman Code specially tailored for that file. ("Generate Huffman Codes").
- Print the Huffman Code Table currently in use. ("Print Huffman Codes").
- Pack a file. ("Pack a File").
- Unpack a file. ("Unpack a File").
- Store the current Huffman Code Table in a file all by itself. ("Save Huffman Codes").
- Retrieve a code table stored by the previous command. ("Load Huffman Codes").
- Open or close any of the three display windows. Some time savings is gained during packing and unpacking by closing the "Unpacked Text" window.
- Quit. Always handy in any program.
- A final menu option toggles whether or not the Huffman Code Table is stored along with the packed text in a packed file.

The Huffman Code Table currently in use, whatever its origin, is always displayed in the window entitled "Huffman Codes."

When a text file is packed or unpacked, the first **MAXTEXT (#defined as 3000)** characters of the unpacked file are displayed for your amusement in the window entitled "Unpacked Text."

The third window, entitled "Pack Data," contains statistics from pack and unpack operations. It shows the length of the unpacked text, in bytes, and the length of the packed data, also in bytes. In addition, the ratio of the length of the packed text to the unpacked text, labeled "packing efficiency," and the theoretical efficiency of the Huffman Code, labeled "efficiency rating," are displayed. This theoretical efficiency is the sum for each code (the product of its normalized frequency of occurrence and the length of its code in bits), all divided by eight; the number of bits in an unpacked ASCII character. The result is a ratio which, when multiplied by the size of an unpacked file, gives the theoretical size of the corresponding packed file.

PACKTEXT seems to be able to compress most pictures, regardless of the theory which guided the program's inception.

THE PROGRAM ITSELF

PACKTEXT's actual workings are left to the intrepid reader to wrestle from the included program listing. An exhaustive walkthrough exceeds the editorial space allotted for a single article. Nevertheless, for the impatient or unwilling, a few notes about the program's operation are in immediate order.

PACKTEXT allows the option of saving the Huffman Code Table itself along with the data in each packed file. Doing so increases the size of each by 1K but allows trouble-free use of customized code tables. The final result may well be a shorter file.

One can also store on disk by itself a single Huffman Code Table gleaned from an analysis of a single representative data file, storing only the data in each packed file. One can also simply use the default code table the program wakes up with, not storing any tables on disk.

With the "Include Codes in File" menu item checked, when the program is told to pack some data file, it will automatically analyze it, creating a customized code table, before packing begins.

The "Generate Huffman Codes" menu item performs only the analysis, creating a customized code table for some data file. "Save. . ." and "Load Huffman Codes" store and retrieve just the code table itself.

Also of interest is the precise meaning of the "efficiencies" the program is always calculating. "Efficiency rating" is the theoretical ratio of packed file size to unpacked file size, calculated from the frequency table and code lengths. "Packing efficiency" is in fact the actual ratio achieved during the last pack (or unpack). If a code table is retrieved from disk, the efficiency rating will be totally inaccurate because the frequency table isn't saved, in the interests of conserving space.

CONCLUSION

PACKTEXT is a versatile program that will certainly find use in some situations. Its most endearing social grace lies in the actual code used to compress and restore files. I hope the readers of START can use my examples to develop their own packing programs. How much can you squeeze down *your* data? ■

DISK INSTRUCTIONS

Every issue of START, The ST Quarterly, contains articles written by some of the finest developers and writers in the Atari computer community. Many of these articles are programming tutorials, detailing how the wizards of the Atari world practice their arcane art. But anyone can benefit from the disk—we provide everything from tax templates for your spreadsheet to full-featured word processors, easy-to-use drawing programs and spectacular graphics demos.

START was designed as a magazine *with* disk, containing the finest ST programs available. If you purchased the $4 non-disk version of START you can still obtain the disk by sending us the bound-in order card or mailing $10.95 plus $2 for postage and handling to: START DISK #5, 544 Second Street, San Francisco, CA 94107. (Be sure to specify the disk you want.) Note: If you want *same day* service, call (415) 957-0886 and ask for the Disk Desk. Give us your MasterCard or Visa number, and we'll send your START disk out that very day!

All programs on the START disk are for your own *private* use, and are not public domain. Please *don't* copy your disk for your friends, accept a copy from someone, or upload these programs on a bulletin board system. That makes it more difficult for us to afford to bring you quality ST programs and incisive technical material. Software piracy hurts everyone.

GETTING STARTED

Use scissors to open your disk envelope along the outside vertical edge, then put the disk in drive A and double-click on the disk icon to see its contents. Refer to your ST owner's manual if you're uncertain about using the Desktop.

Important: Before you do anything else, *back up your START disk*— it's not copy-protected. Format a fresh disk as single-sided, and copy your entire START disk to it. Finished? Now place your original START disk in a safe place and begin using the new copy.

WHEREFORE ARC THOU?

In each issue of START, our pages for features, departments and reviews are at a premium— and our disk space for programs is as precious as lemonade in the Sahara. We have to fit a *lot* of programs on every START disk, and to do that we compress the files into *archives*.

The ARC system was originally developed for MS-DOS computers, and was implemented on the ST by Harvey Johnson of Palm Bay, Florida. With ARC you can compress many different files together into a single file, reducing the total size by 40 percent or more—and then later expand the file back into its original parts. We chose ARC because it's efficient and bulletproof—the same reason it's CompuServe's preferred compressor/librarian. You can download a complete set of ARC utilities from CompuServe's ATARI16 forum and many other online services and bulletin boards. It's also available for $12 (plus $3 postage and handling) from The Catalog, which is bound into the middle of this issue of START.

You'll find the program ARCX.TTP on your START disk—it's a compact version of ARC that can only decompress ARC files. Using it is simple. Suppose there's a file on the START disk called FOO.ARC. To un-ARC it, first copy FOO.ARC and ARCX.TTP to a freshly formatted disk. Double-click on ARCX.TTP, then type in the name of the file you want to decompress, FOO.ARC, and press the Return key. ARC will un-ARC the files inside FOO.ARC and place them on the disk. That's all there is to it!

ON THE DISK

- **ARCX.TTP** The unARCing utility. Double-click on this to decompress a file.
- **BENCHMRK.ARC** Dave Plotkin works for the oil industry, and he's one slick programmer. In this issue's **BASICs for the ST**, Dave pits five different versions of BASIC against each other in mortal combat. These are the benchmarks he used, for Fast ST BASIC (FSTBSTST.BSC), GFA BASIC (GFABASTS.BAS), standard ST BASIC and the LDW compiler (STBASTST.BAS), and SoftWorks BASIC (SWBASTST.BAS).
- **CLI.ARC** What's better than getting WordPerfect early? How about a peek over the shoulder of the man who programmed it? In **Escape From the Desktop**, Jeff Wilson brings an IBM-style Command Line Interpreter to the ST. Here's the working desk accessory (CLI.ACC) and the assembly-language source (CLI.ASM and MACROS.CLI), which include scads of programming examples for accessing TOS-level file handling routines.
- **DECOMM.ARC** Imagine using a great product for a while, and then discovering a whole new side to it. Tom Hudson designed DEGAS Elite and the new CAD-3D Version 2.0 so other programmers could easily hook into them, and in **Plumbing GEM's Mysteries** he shows how you can do it yourself. DECOMM.ACC is a sample "test everything" desk accessory, and DECOMM.C is its source code in Alcyon C.
- **FLICKER.ARC** Jim Kent, author of Animator ST from Aegis, jumped at the chance to demonstrate how basic animation is performed on the Atari ST in **Flicker**. The program FLICKER.PRG is where it all comes together, and GRAMMA.SEQ and WINK.SEQ are sample animation files.

DISK INSTRUCTIONS

But to see how Jim created this marvel in Aztec C, choose a long, sultry summer afternoon to examine the 35 (gulp!) source files: ABLIT.C, ALINE.ASM, ALINE.H, BRUSH.C, CELPULL.C, CIRCLE.ASM, CLIPS.C, CLOCK.ASM, CONV.ASM, DISK.ASM, DRABRUSH.ASM, FASTRAND.ASM, FILEREQ.C, FILES.C, FINDCOL.C, FLICKER.H, FOO.C, FRAMES.C, GFX.ASM, INIT_SYS.C, INPUT.C, MAIN.C, MEMORY.C, MULTIOPS.ASM, PENTOOLS.C, POLAR.ASM, PRIM.C, PULL.C, PUTDOT.ASM, SINE.C, SQR_ROOT.C, STRETCH.ASM, UNDERMOU.ASM, ZOOM.ASM, and ZOOMTAB.ASM. There's also MAKEFILE and FLICKER.LNK, which Aztec C uses to sew them all together.

- **MIDISAVE.ARC** In **Save Your Synthesizer Sounds**, Tom Bajoras of Hybrid Arts shows you how to use your ST to remember patch settings for MIDI synthesizers like the Yamaha DX7 and the Casio CZ101. Tom's MIDI generic patch editor, MIDISAVE.TOS, is here along with the source code in C (1.C) and assembler (2.S).
- **PACKTEXT.ARC** You can't fit two gallons of water in a one gallon jug, but Dan Matejka's **Packtext** shows how to fit two files in the space one would normally take up. Dan's text compression program (PACKTEXT.PRG) and C source code (PACKTEXT.C) demonstrate some of the techniques used in full-scale compression systems like ARC.
- **TOOLKIT.ARC** START Technical Editor Patrick Bass heard Tom Hudson talking about the DEGAS Elite pipeline, and sat down to create **A Super Toolkit for DEGAS Elite**. Patrick's toolkit contains two desk accessories: a Screen Operator named OPERATOR.ACC (the Alcyon C Source files are OPERATOR.C and OPERATOR.H, and you'll need the resource file OPERATOR.RSC to run the desk accessory) and a Page Flipper named PAGEFLIP.ACC (Alcyon C source PAGEFLIP.C and PAGEFLIP.H, resource file PAGEFLIP.RSC).
- **TWISTER.ARC** Back again! This time, TWISTER.PRG is the *corrected* version of the Twister floppy-disk formatting program from last issue's **Hard Disk Warfare** by Dave Small and Dan Moore. Check the Alert Box (right next to **Dialog Box** at the front of this issue) for details of the fix.

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AN IN-DEPTH LOOK AT WORD WRITER ST, DATA MANAGER ST AND SWIFTCALC ST

BY MATT LOVELESS
CONSULTING EDITOR

No software collection is complete without the three staples of modern-day computing—a word processor for creating documents, a database for maintaining lists, and a spreadsheet for working with numbers. Timeworks has entered the ST market with one of each—Word Writer ST, Data Manager ST, and SwiftCalc ST—and they've hit the ground running.

Each of the three programs is sold separately, and they work well as stand-alone programs; if you don't need a spreadsheet, your Timeworks database or word processor will function fine by itself. But these products were designed as a package: you can integrate much of the data from one program into another. For example, a small business could use Data Manager ST to keep track of data (clients, inventory, payables, and receivables), SwiftCalc ST's spreadsheet for sophisticated fiscal reporting and forecasting, and Word Writer ST to combine numbers with text in a sharp-looking business plan to send to potential investors.

Though you can move data between the three programs, it's nothing like the integration in a package like Framework for the IBM PC. Still, it's an added bonus if you buy more than one of the Timeworks products. The performance of the programs themselves, combined with Timeworks' support, upgrades, and an amazing satisfaction guarantee, make these three packages first rate.

Photography: Mary Rhomberg Lowery

GENERAL NOTES

Word Writer ST, Data Manager ST, and SwiftCalc ST each come enclosed in a three-ring binder and plastic slipcase. The documentation is typeset with a table of contents, index, glossary, and quick reference section; the Word Writer ST manual also has tabbed separators to help you find major sections quickly. The documentation begins by stepping you through running the program and formatting blank disks—a new ST owner could probably begin working with these programs within an hour of hooking up the machine.

As an experienced user, I found I could use 90 percent of Word Writer ST without consulting the documentation; Data ▶

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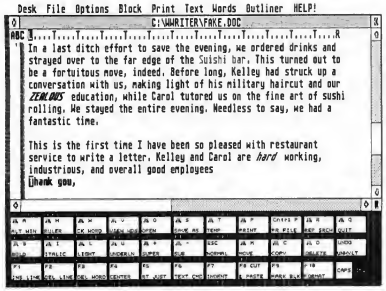

Figure 1: Word Writer ST

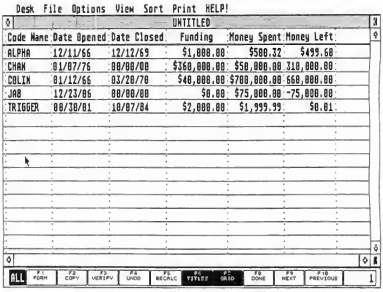

Figure 2: Data Manager ST in column mode

Manager ST required a brief look at the tutorial and some time looking things up; and I had to read most of the SwiftCalc ST manual before getting started. To some extent this reflects the relative complexity of the three programs. The main functions of the programs are well-documented in a friendly, easy-to-read style, but I found some egregious omissions in the manuals—there was virtually no documentation on Super Graphics (included with Data Manager ST and SwiftCalc ST), and Sideways (included with SwiftCalc ST).

All three programs use GEM and include extensive online help; the help screens are usually called up by selecting an item under the HELP! drop-down menu. Word Writer ST and Data Manager ST use a scrolling center-screen help window that you can page through as you please. SwiftCalc ST's help window takes over the whole screen, which is slow and cumbersome. It's context-sensitive, though: if you are in the middle of a complex command and you press the Help key, the help screen will describe your current options. The program is fairly good at recognizing what you're looking for, but sometimes it will miss and bring up an irrelevant screen. With all three programs, you can delete the help screens when you no longer need them, thereby freeing up valuable disk space.

WORD WRITER ST

Word Writer ST, the word processor, looks and acts very much like 1ST Word, the first ST GEM-based word processor, which was distributed by Atari with all ST computers until sometime last year. 1ST Word is probably the most popular word processor for the ST; Timeworks took 1ST Word's basic design and expanded it, improving the user interface and adding a 90,000 word spelling checker and built-in outline processor. Like 1ST Word, Word Writer ST is strictly for text documents and cannot mix text and graphics. The two programs can use each other's files.

THE BASIC LOOK AND FEEL

When you open a Word Writer ST document, it comes up in a large GEM window. The window shows the document's name, the current cursor position, tab stops, margins, text mode, and page breaks; you can scroll through your document using the scroll arrows and slider bars.

At the bottom edge of the screen the program displays the meaning of the function keys (which Timeworks calls Quick Keys); you can select a function by pressing the appropriate key or clicking on the display button. Resizing the window reveals another 22 Quick Keys (see *Figure 1*), which also have keyboard equivalents; some perform functions available from the drop-down menus. This means you don't waste much time switching from keyboard to mouse and vice versa—and if you ever forget a keyboard command, it's there on your screen.

BUILDING DOCUMENTS

Word Writer ST is a What You See Is What You Get word processor, a fancy way of saying whatever appears on the screen is pretty much what will appear on the printout. Italics, underlining, light, and boldface show up on the screen, and if your printer supports them, they'll be in your document, too. Word Writer ST does not directly support condensed or enlarged print, but you can embed printer commands in your document to take advantage of those features of your printer. To start typing in italics, for example, you press [Alternate]-[I] or click on the italics button on the screen; to turn italics off, press [Alternate]-[I] again. The current text mode is shown in the upper left corner of the window and you can return to normal text in one keystroke by pressing [Esc].

To change a large block of text from, say, boldface to light, you can select the beginning and end of the block either with

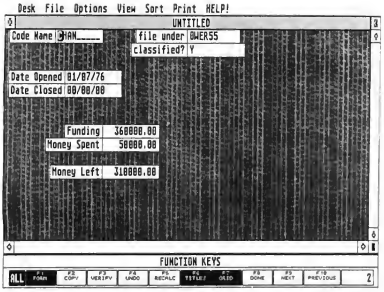

Figure 3: Data Manager ST in form mode

the [F9] key or by dragging the cursor. Once a block is defined it's highlighted on the screen, and you can change its text mode by pressing keys or clicking buttons.

Word Writer ST also has a feature that lets you automatically indent the left margin of an entire paragraph by pressing the [F7] key. Each time you press it, the margin is moved in to the next tab stop. It's a nice feature for making lists, points, and tables, and the program remembers the indentation if you reformat the paragraph. (If you also want to indent the right margin—say, for a quote—you must change the margin in the margin line at the top of the window.)

THE GOOD OL' [F10] KEY

Like any good word processor, Word Writer ST handles word wrap automatically when you type in a document. Like 1ST Word, though, it does not dynamically reformat your paragraphs; if you insert or delete text in the middle of a paragraph, the text can become fragmented. You can reformat the paragraph by pressing the [F10] key.

The advantage is that Word Writer ST won't make changes in the way your document looks until you tell it to; if you want a chart to be unevenly spaced, that's just what you'll get. The disadvantage is that, if you have changed the line spacing or the right margin and then reformat a paragraph, the program uses the current settings rather than those you used to format the paragraph. This can be a real drag if your document has lots of complex formatting, such as indentation and changes from single to double spacing. I often want to print out double-spaced drafts for editing and then make my final document single-spaced; with Word Writer ST I have to type my document double spaced and then reformat it entirely for the final printout. Timeworks isn't alone in these shortcomings, but it's something you should consider before buying.

To their credit, Timeworks adds a menu selection that lets you reformat an entire document with one mouse click. Of course, the special paragraph format problem still applies because Word Writer ST will format every paragraph to the current settings.

EDITING TEXT

The text editor is just acceptably fast. I can type faster than it can display, and so can anyone who can type over 30 words per minute. The keystrokes are buffered, though, so nothing is lost.

Word Writer ST sports a range of basic editing keystrokes: insert or typeover; go to beginning of line, end of line, top of window, bottom of window, top of document, or bottom of document; delete line, word, or to end of line; and center a line. There are some keystrokes I really miss, like toggle upper/lower case, but the major bases are covered.

You can have up to four documents open at once, each in its own window, and you can cut and paste between them. Word Writer ST supports such block operations as cut, paste, delete, copy, and move. You can even quickly move to the top or bottom of a block. There are both search and replace functions, but the search is merely a text search; you can't use it to find or replace formatting codes like carriage returns.

Word Writer ST allows you to edit straight ASCII files (text files without any formatting codes), and you can easily merge two files into one long one. There is also a handy status feature that quickly tells you the number of pages, lines, words, and characters in your document, in addition to the remaining free memory.

THE OUTLINER

Included in the Word Writer ST program is a bare-bones outliner. When you select Open Outline Form from the drop-down menu, a new window will open up as an outline. An outline window is like a document window except that it has special indentation features, allowing you to manipulate an outline with up to five levels of hierarchy. The word processing editing keys function while you're in outline mode; you have access to some special functions that let you build and rearrange outline headings. It is very easy to confuse the outliner when you are editing headings; keystrokes don't always perform the way you expect them to perform and your outline can easily get out of sync with the outliner. I found it frustrating to use and not really worth the trouble.

THE SPELLING CHECKER

Word Writer ST has a 90,000 word spelling checker built into the program. To use it, the program must load the dictionary into memory; it's about 128K in 26 files (one file for each letter of the alphabet). This takes quite a while to load from ▶

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floppies and significantly reduces your free memory. If you have 512K of memory, you will only be able to spellcheck about ten pages at a time; you'll have to break your document up into ten-page segments. On a one megabyte machine, memory for the spelling checker isn't so much a problem.

The spelling checker runs in three modes: continuous spellcheck, spellcheck on key, and spellcheck document. The continuous spellcheck option checks your spelling as you type; if it finds a word it thinks is misspelled, it will alert you right away. The spellcheck on key option lets you check the word you just typed or the word under the cursor. The spellcheck document option scans your entire document at once, looking for misspelled words.

The dictionary is big enough to be fairly useful, but unfortunately, it's not expandable. When it catches a misspelled word it presents you with a number of similarly spelled words and you can either choose the correct word with the mouse or type in the correct spelling. If the spelling checker flags a word that is spelled correctly but not in its dictionary, you can click on the OK button and it will enter the word in its RAM dictionary and not flag it again until you exit Word Writer ST, so proper names and obscure words only get flagged once.

PRINTING DOCUMENTS

For printing your document, you can set header and footer lines, page number position, and starting number of the first page, in addition to the top margin, bottom margin, and page size. You can opt to print only a selected range of pages and you can print multiple copies. You can even select "book printout," which alternates the margins for left and right pages, as in a book.

Word Writer ST spools your printer output: it first prints your document to disk, which takes only a short time, then it allows you to go back and edit the current document or another document. While you're editing, Word Writer is simultaneously reading the printed file from the disk and sending it to your printer, so you don't have to wait around for your printer to finish. This does pose a problem if your disk is nearly full; fortunately, you can delete files directly from the File drop-down menu until enough space is freed up. You can also insert another disk with more free space.

Drivers for most major printers are included, and Word Writer ST comes with a very easy-to-use configure program that lets you build your own printer drivers. There's even a really nice chapter in the manual entitled "Unravelling the Mystery of Your Printer."

INTEGRATION

Word Writer ST's integration with Data Manager ST and SwiftCalc ST is rather unsophisticated: it simply reads in a text file. This lets you include tables, reports, and other data in your documents, but it does not allow an automated mail-merge, for example.

FIRST QUARTER 1987 ACCOUNTING

MGL 4/01/87

CLIENT	INVOICE #	INVOICE DATE	INVOICE AMT	AMOUNT PAID	BALANCE DUE
Acme CIC	9	04/02/87	$780.00	$0.00	$780.00
			$780.00	$0.00	$780.00
Chan Inc.	10	05/03/87	$10,000.00	$20.00	$9,980.00
			$10,000.00	$20.00	$9,980.00
Calin Eng	11	07/23/87	$4,882.57	$500.00	$4,382.57
			$4,882.57	$500.00	$4,382.57
Frog Co.	8	03/23/87	$3,673.12	$2,543.00	$1,130.12
			$3,673.12	$2,543.00	$1,130.12
SBS Inc.	2	12/11/86	$200.00	$30.00	$170.00
	6	03/10/87	$2,200.00	$300.00	$1,900.00
	7	03/10/87	$8,154.00	$0.00	$8,154.00
			$10,554.00	$330.00	$10,224.00
START	1	00/00/00	$759.00	$0.00	$759.00
	3	03/08/87	$310.00	$0.00	$310.00
	4	03/08/87	$310.00	$0.00	$310.00
	5	03/08/87	$325.00	$0.00	$325.00
			$1,704.00	$0.00	$1,704.00
			$31,593.69	$3,393.00	$28,200.69

Figure 4: Report created with Data Manager ST

CONCLUSION

Word Writer ST is a very good general-purpose word processor—certainly one of the best. Experienced word-processor users may feel encumbered by the mouse interface and the speed limitations imposed by GEM, but it's very much an improvement upon 1ST Word. It is simple to use and fairly powerful, and has some nice extras that mark it as a professional product. There are a few minor bugs and some very real limitations, though, like the unexpandable dictionary.

According to Timeworks, Word Writer ST is currently under revision and a new version will be out soon. Considering their liberal upgrade policy (see below), it wouldn't be a mistake to purchase it now. If you are new to word processing and want a solid, uncomplicated program, this is a sterling buy.

Personally, I use only two word processors: ST Writer and Word Writer ST. I use ST Writer for long documents that don't require sophisticated formatting; it's fast and makes major editing a simple job. I use Word Writer ST for short letters and notes (less than five pages) because it is so easy to get the document to look exactly like I want it to; to do that in ST Writer would require two or three trial printouts and a lot of parameter tweaking. (Editor's note: *ST Writer is a word processor distributed free of charge by Atari Corp. It is available on many online services, such as CompuServe and GEnie, and from user groups. ST Writer version 1.50 is part of the Winter 1986 START*

disk; see Bruce Noonan's "ST Writer Secrets," START Magazine, Winter 1986, issue #3.)

DATA MANAGER ST

Data Manager ST is the jewel among the three Timeworks products—an extremely well written, carefully polished non-relational database that includes a healthy assortment of fields (text, numeric, and calculated), suitable for keeping track of anything from a Christmas mailing list to a small company's invoices. Like Word Writer ST, Data Manager is not designed to be ultra-powerful; instead, Timeworks has hit upon the perfect trade-off between power and ease of use. It's a pleasure to work with Data Manager ST.

THE BASIC LOOK AND FEEL

Data Manager ST works with and displays data in two basic modes: column and form. Column mode places your whole database inside a spreadsheet-like window, with your field names across the top of each column and every record on its own row (see *Figure 2*). This gives you an "overhead" view of your data. You can instantly jump into form view by selecting form mode, which shows you one record in your current database (see *Figure 3*). You can move forward and backward through your database at the press of a key or the click of the mouse, and edit a record or enter a new record at any time.

If

you can find

a competing product

that works better for you,

Timeworks will actually buy

the product for you—that

takes confidence.

The form and column displays support and complement each other in a superbly intuitive manner. You can manipulate your entire database at the surface level in the column mode, and change individual records in the form mode. Virtually every major command is available from both modes and you can switch modes at will.

CREATING AND MODIFYING A FORM

Creating or modifying a form is simplicity itself. In creating a new field the program leads you through a series of dialog boxes where you specify the field's name and format. Basic field formats available are text (letters and numbers), alphabetic (letters only), numeric, Yes/No, calculated, form title, time, and date; you can also specify a custom format.

For numeric fields, you can specify how the data should appear (leading dollar signs, number of places after decimal point, etc.). With a custom format field, you specify the *exact* type of text allowed in the field. For example, say your company's purchase orders always begin with two uppercase letters, followed by 5 numbers, followed by a lower case letter; you could design a field so you could enter only data that matched this format.

Calculated fields are the most powerful. You could calculate your profit, for example, by subtracting the cost column from the price column. With IF, THEN, and ELSE lines, you can perform conditional calculations; for example, a field could calculate a 10% discount if an order is for $5,000 or more, but give no discount if the order is less than $5,000.

Once you have created a field, you can immediately begin entering information into it. You can move a field to a new location on the column display by selecting it and choosing the move column command; on the form display you can drag it with the mouse. You can also make the size of the field larger or smaller just by dragging the field's rectangle to a different size.

ENTERING AND EDITING DATA

You enter and edit data into your database from the form mode, which acts like a giant dialog box. You can move from field to field with the arrow keys or the mouse, and you can clear a field with the Escape key. There's not much to learn; you just enter your data. Data Manager ST will alert you if something goes wrong. You can easily move from record to record, editing as you go, or you can jump directly to the last record (which is blank) to make an completely new entry.

If you're in column mode and want to examine or edit an entry, simply double-click on the item. You will be transferred to form mode instantly and that record will be called up. Entering and editing are virtually instantaneous, since Data Manager keeps the entire database in memory.

VIEWING

You view your entire database in the column mode. Unless you have limited your view or hidden columns, the column mode will display all the information currently in your database. The key to extracting specific information in your database is selectively limiting, or sharpening, the column view until just the information you desire appears in the window. ▶

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The first method for limiting your view is to hide columns. Once you've hidden a column, it won't show up in the column view until you reveal it again. The information won't be displayed and won't print out, but any calculated columns will have access to the hidden column's information.

Once you have hidden unwanted columns, you can begin focusing and organizing specific data by using sorts and searches. For example, say I have created an accounting database for my business and I want to send out a bill to all the companies with names beginning with A through L that owe me more than $500. The first thing I would do is select View by Range and tell it I want all the records in which the data in the Company Name field falls in the range of A to L. Data Manager ST will search through my database and temporarily hide all the records that don't fall in that range. Now I have the A through L companies.

I then choose View by Specification, such that the data in the Total Receivables column is greater than $500. Data Manager ST will further limit my database, hiding all companies that owe me less than $500. Now I can sort them by the date the payment was due (placing the most delinquent payments at the top) and print out a list for the collections department.

This concept of successively narrowing your view of the records lets you make your record selection as complicated and as specific as you want. Most databases require that you enter all the limiting criteria at once and require that you use non-intuitive Boolean operators (such as AND, OR, and NOT). Data Manager ST eliminates all this confusion by giving you free rein and allowing you to zoom in on your data as if it were all on 3-by-5 cards rather than in a computer's memory.

PRINTING FORMS, LABELS, AND REPORTS

The simplest type of printout is the form printout; it simply prints all the records and columns that aren't hidden. By hiding columns, moving columns, and using view by range and specification, you can customize the printout. You can also set printout parameters like margins, paper size, and any special printer codes.

Printing labels is like printing forms, except that the data is printed in standard label format. This way you could make a mailing list automatically or make I.D. tags for your office equipment. The records and fields you want printed are limited in the same way as a form printout.

The report writing feature is the most sophisticated type of printout. Like forms and labels, you can first limit the records and fields you'll use, but you also have the option of multiple and hierarchical subtotals and running totals. You may also place up to six lines of header and footer information on each page and set the page size, margins, and printer codes. See *Figure 4* for an example of a report generated with Data Manager ST. The report writing feature handles its task fairly well. Unlike many databases, it is very simple to specify the report format and get instant, good-looking reports. However, for this simplicity you sacrifice flexibility.

INTEGRATION

Data Manager ST creates different types of data files for Word Writer ST and SwiftCalc ST. The SwiftCalc-type file is essentially a form printout written to disk in the DIF format; this can be used to pass text and numbers to a SwiftCalc spreadsheet. The Word Writer output is exactly like a printed report output, except the information is written to a Word Writer file rather than sent to the printer. Data Manager ST will not import any information directly.

A new ST owner can probably begin working with these products within an hour or so of hooking up the machine.

THE SUPER GRAPHICS PROGRAM

Included with Data Manager ST and SwiftCalc ST is the Super Graphics program. Super Graphics is a wonderfully powerful graphing program; Timeworks could probably sell it for $40 if they wanted to—it's that good. Instead, they decided to include it with Data Manager and SwiftCalc.

Super Graphics supports horizontal and vertical bar charts and line and scientific graphs. There are also various types of each graph—a total of 15 ways to display your data. Some of the more interesting modes include stock charts (with highs and lows), Gannt charts (for project planning), and summed line charts.

To use the Super Graphics program with Data Manager ST, you first manipulate your database so only the information you want to use is displayed, then save it in a special graph file format. Then you leave Data Manager ST and enter the Super Graphics program; once there, you import your data, selecting rows and columns of labels or numbers. Once the data is in Super Graphics format, you can display it using any of the various graph types. Additionally, you can add legends, headers, footers, and change the colors and fill patterns of

your graph—you can adjust the graph's appearance quite a bit.

The graph is initially displayed on the computer screen, but once it's the way you like it, you can output it to a printer or plotter. Unfortunately (and this is the program's major flaw) Super Graphics only supports four types of printers, all made by Epson (the MX, FX, RX, and LQ series) and three types of plotters (Epson Hi-80, Com Scriber, and Sweet-P)—but not such plotters as the industry-standard Hewlett-Packard 74/75A. Admittedly, it's difficult to develop virtual-device printer drivers, but unless you own one of these printers or plotters (or a compatible), the usefulness of the Super Graphics program drops considerably. I was only able to try the printer output and I found it very acceptable (see *Figure 5.*). You can print in high or low resolution on 8½- or 14-inch-wide paper.

Super Graphics is a very nice program. Importing data can be confusing, though, and the documentation is extremely sparse, doing little more than describe the types of graphs available. I had to spend more than 15 hours experimenting before I could get my graphs to appear as I wanted them.

CONCLUSION

Data Manager ST is a marvelous piece of craftsmanship. It is my favorite of the Timeworks programs and I can see using it for a very long time. Hands down, it's the best non-relational database for the ST computers and one of the best I have seen for *any* computer. Data Manager ST is simple to use, with a delightful user interface and a fairly powerful set of searching, sorting, calculating, and output abilities. It is not, however, a data-cruncher; if you're looking to manipulate massive amounts of strange data, you should investigate some of the other database programs available. (See Brian Lee's "ST Database Management Systems," START, Spring 1987, #4.)

SWIFTCALC ST

SwiftCalc ST is a spreadsheet program—a giant sheet of electronic accounting paper (see *Figure 6*). Each cell in a spreadsheet can hold text, a number, or a formula. A text cell is usually used for identifying a portion of a spreadsheet—for example, "Yearly Sales," "Total," or "January Expenses." A number cell simply holds a number that is used in the calculations. A formula cell is the real meat: it relates number cells and other formula cells using a mathematical formula; for example, the cell that calculates profit might be set to price minus cost. A spreadsheet can be used for anything from calculating your taxes to forecasting your net worth.

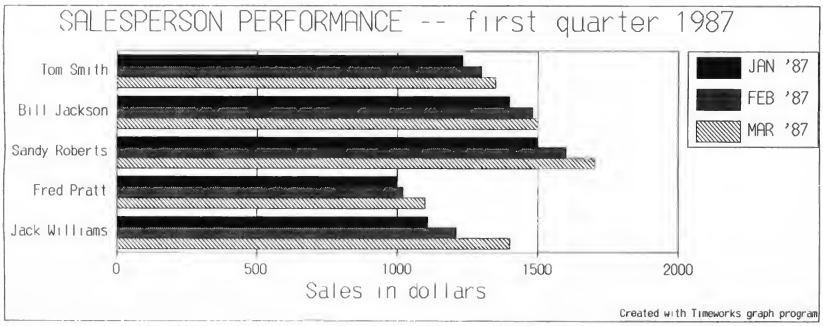
THE BASIC LOOK AND FEEL

OK—the bad news first.

SwiftCalc ST has the guts of a decent keyboard-controlled spreadsheet, much like VisiCalc or Lotus 1-2-3—except, in what appears to be a last-minute effort, Timeworks has added a GEM front to it. Now it looks like a keyboard-controlled spreadsheet inside a window. Not a good sign.

This incomplete and unholy marriage between GEM and keyboard has some basic design flaws. First, SwiftCalc ST is far too slow in updating the screen. (That's actually a bit ironic when you consider the name of the product.) For example, when you move the cursor off the edge of the screen and the spreadsheet scrolls, it takes *over a second* to scroll one cell position vertically. That's ten seconds to move down ten cells—slightly less than eternity, but when you're sitting there watching it happen, it's excruciating. There are some tricks to speed up movement, but I found none of them very satisfactory. ▶

Figure 5: Graph created with Super Graphics



Timeworks...

Second, the user interface needs some work. You select functions through a bizarre and inconsistent hybrid of mouse and keyboard input. Sometimes you point and click with the mouse and sometimes you use the keyboard. It is definitely not intuitive. If you restrict yourself to using the keyboard commands entirely, it's just like operating a fairly decent non-GEM spreadsheet. It's as if GEM had been added as an afterthought. Using SwiftCalc ST is not only confusing and frustrating, it's plain inefficient.

Lest I seem unfairly critical of SwiftCalc ST, let me say that I really want to like this product. Six months ago, this half-GEM stuff would have been par for the course. Since then, though, spreadsheet user-interfaces have matured (most notably with the release of the GEM version of V.I.P. Professional). Timeworks has even set their own standard of excellence with Word Writer ST and Data Manager ST. Compared to them, SwiftCalc ST just doesn't measure up. As you will see, it is otherwise a fairly robust spreadsheet. Another two months of thoughtful development and testing probably would have paid off in the long run.

WORKING WITH SWIFTCALC

When SwiftCalc ST first loads, it starts you out with a blank spreadsheet. You can immediately start building a new spreadsheet or load one off disk. Across the top of the screen is the SwiftCalc menu bar and in the open window on the screen is your spreadsheet. You can move around your spreadsheet with the cursor keys, the scroll bars, and the "goto" command. You can also select any cell within the current window with the mouse. A line at the bottom of the window displays the contents of the current cell—a very helpful feature. SwiftCalc supports up to 8,192 rows and 256 columns—that's much larger than you should ever need.

Most commands can be initiated from the GEM menu bar. However, many of them, once chosen, require some sort of secondary action with the keyboard. Ideally, these would have been handled by dialog boxes, but instead you are confronted with text choices at the bottom of the window and you must take your hands off the mouse and respond on the keyboard. This results in frequent jumps from mouse to keyboard to mouse. Some of the more esoteric commands cannot even be accessed from the drop-down menus; you need to get at them entirely from the keybaord. The more popular commands, such as recalculate and insert column, are assigned to the function keys, and many menu items have Quick Key equivalents (where you press [Alternate] plus some letter key). However, this only manages to confuse things: Do I press [Alt]-[O] or type /L to load a file? Also, unlike Word Writer ST or Data Manager ST, there are no Quick Key buttons at the bottom of the screen. Fortunately, the help function is context sensitive and will more often than not pull up useful information when you're stuck.

CALCULATION FACILITIES

SwiftCalc ST will accept cell formulas up to a maximum of 69 characters in length. In addition to the standard mathematical functions (addition, subtraction, etc.), SwiftCalc also includes roots and powers, natural logarithms and common logarithms, degrees-to-radians and radians-to-degrees, cosine, sine, and tangent, and their inverses, and constants such as pi and e.

SwiftCalc ST will also operate on ranges of cells and allow you to find the minimum value, maximum value, average value, sum, and number of values in the range (not counting blank or text cells). Also included are the cornerstones for financial analysis: compute present value of a dollar, compute future value of a dollar, compute present value of an annuity, and compute the future value of an annuity.

For calculations requiring some sort of table data, there are CHOOSE and LOOKUP. The CHOOSE function is an array lookup table; if you pass it a 13, it will give you the value of the 13th cell in a specified range. The LOOKUP function will search through the cells in a specified range, looking for a number greater than the number you pass to it; when it finds such a number, it returns the value from an adjacent cell. Range lookups are crucial for tax spreadsheets and other similar table-heavy calculations.

SwiftCalc ST supports an if. . .then type construct, allowing a cell to evaluate to one value if the expression is true and to another if it is false. You can use the standard comparators (<, >, <=, etc.) in your expressions, along with the logical operators AND and OR.

OTHER FEATURES

Most spreadsheets allow you to set the format of the cell, which determines how the data will be displayed (for example, right-justified, left-justified, or centered, using dollar signs or commas, etc.). A unique variation on the basic formats that SwiftCalc supports is the scale factor, a number between 0 and 9 that scales the value printed in the cell down by 10 raised to the scale power. This allows you express financial statements in millions or the national debt in trillions. SwiftCalc ST, however, only allows you to use and define eight different formats; most spreadsheets let you define as many as you want.

SwiftCalc ST only allows one file to be loaded at once, but you can split your screen into two separate windows on the same spreadsheet. The two windows can be set to scroll together or separately. By opening two windows, you can enter data at one end of your spreadsheet and watch results at the other.

You can do multilevel ascending and descending sorts on your spreadsheet; you can assign names to individual cells; and you can copy, move, and delete blocks. There is even an

"intelligent" copy and delete called data query, which searches a range and extracts the information you specify and either deletes it or copies it to another part of the spreadsheet. You can also use the data fill option to fill a range of cells with a range of values. Or you can generate a table of values by specifying a formula to calculate the values; SwiftCalc will stuff them into the range automatically to build the table.

One of the most powerful features of SwiftCalc ST is the join function. Join allows you to pull in values from other spreadsheets on your disk. You pick a destination cell in your current spreadsheet and choose join; it prompts you for a

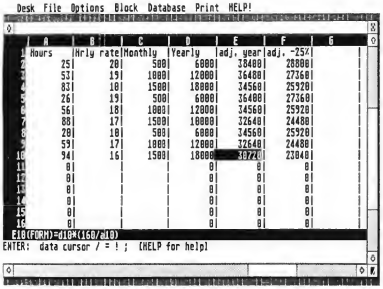


Figure 6: SwiftCalc ST

filename and a cell location in that file. Once you've set up these links in your spreadsheet, whenever you recalculate SwiftCalc ST will pull the values off of the disk files and enter them into the linked cells. The links are saved along with your spreadsheets. This lets you create massive, interconnected spreadsheets.

INTEGRATION

SwiftCalc ST will import (and export) DIF files. DIF is a standardized spreadsheet output format that holds the labels and values in cells but not the formulas. DIF capability makes SwiftCalc ST data compatible with DataManager ST and other spreadsheets which also use this format. You can also "print" your spreadsheet to disk in Word Writer ST format so you can merge your data with your text.

SwiftCalc also includes the Super Graphics program, and it works very well as a data generator, allowing you to take full advantage of the various graphs.

PRINTING SPREADSHEETS

There are two ways of printing your spreadsheet. You can print it normally from within the spreadsheet, which prints the columns across the top of the page and rows downward. This limits you to 80 characters of columns with a normal carriage printer, unless you switch into condensed mode. I was unable to send my printer the correct commands because the printer setup feature wouldn't let me send an escape code. (Timeworks customer support acknowledged this problem.)

The second way of printing your spreadsheet is with the Sideways program included on the SwiftCalc disk. Sideways is a program from Funk Software that lets you print your spreadsheets sideways, so you can use as many columns as you want (having it print across multiple sheets of fanfold paper). Most spreadsheets are wider than they are long, so this is a very useful utility. The Sideways program works very well, although it is slow. It supports more than 15 of the most popular dot-matrix printers, and will print your spreadsheet out horizontally in a choice of font styles, ranging from minuscule to mammoth.

CONCLUSION

SwiftCalc ST is a powerful enough program for most people, though it is missing some the common spreadsheet features, such as macros. Its fatal flaw, however, is its user interface, which is inconsistent and clumsy. If you are interested in the spreadsheet to complete your Timeworks package, weigh your options carefully: any spreadsheet that can load DIF files should be able to read Data Manager ST files written out in SwiftCalc ST format, and if the spreadsheet can print to disk (most can) you can load it into Word Writer ST as an ASCII file and merge it with your document. In its present state, I wouldn't buy SwiftCalc, except maybe to get the graphing program if I didn't already have Data Manager ST. With the GEM/keyboard schizophrenia removed and the speed problem resolved, it would be a valuable and useful program. I do believe that Timeworks realizes the deficiences in the current version and will plan a major revision sometime this year.

PRODUCT PHILOSOPHY: THE BEST IN THE BUSINESS

When you buy a Timeworks product, you don't just get a disk, a manual, and a shove out the door; you buy into a whole network of support and ideology.

First, they have an amazing guarantee: if, within 90 days of your purchase, you can find a competing product that works better for you, simply send in your Word Writer ST, Data Manager ST, or SwiftCalc ST, along with the name of the product you want and any retail price difference. Timeworks will actually *buy the product for you*. You almost can't go wrong buying a Timeworks product; if you don't like it, send it in for something new. A guarantee like that takes confidence.

And there's another show of confidence: Timeworks does not copy-protect their software, so you can make as many backup copies as you want for your own use, and painlessly ▶

Timeworks...

install the programs onto a hard disk. I hope Timeworks won't get burned by rampant software piracy.

Timeworks maintains a toll-free customer support helpline for registered owners of their products. It's open weekdays, 9 to 5 Central time. I found the customer support team to be friendly and helpful; they were very familiar with their products and manuals and able to answer my questions quickly.

UPGRADES

Timeworks recognizes two types of upgrades: product upgrades and equipment upgrades. The product upgrades are pretty standard. Timeworks tries to revise each of their products at least once a year; when they do, each registered owner will get a mailing describing the upgrade (added features and fixed bugs), including instructions on how to get it. Usually there is a small upgrade charge that is proportional to the significance of the revision. For example, a simple bug revision would cost you the price of a disk plus a modest postage and handling charge, whereas a full upgrade, where significant enhancements have been made to the program, might cost you $20.

Equipment upgrades are a bit more interesting. If you buy a Timeworks program and then buy a different computer, you can get any Timeworks product for your new computer by sending in your old program along with $7.70 plus the retail price difference. This isn't that significant a benefit for ST owners—we already know the next generation from Atari (the Mega ST) will be upwardly compatible with the current machines. But say you own a Commodore 128 and a couple of Timeworks products. If you buy an ST, you can get the ST versions of your software at a very small cost.

HOW IT ALL ADDS UP

Word Writer ST, Data Manager ST, and SwiftCalc ST are all straightforward entry-level products. They aren't designed for power users, but they *are* fairly powerful and easy to use. Word Writer ST and Data Manager ST set standards for price/performance and ease of use. SwiftCalc ST is not a bad program, but it's not nearly as polished as the other two—investigate its competition before buying.

With Timeworks' support and guarantee and the power of Word Writer ST and Data Manager ST—and the likelihood that SwiftCalc ST will improve soon—I look forward to more high-quality products from Timeworks. ■

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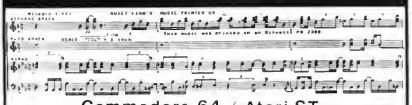

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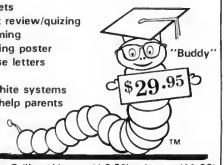

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Save Your Synthesizer Sounds

MIDISAVE, a Casio and Yamaha patch librarian

by TOM BAJORAS

In our ongoing support for the ST and the world of music, we present MIDISAVE—a simple patch librarian that works with most synthesizers, including the Casio series with its offbeat protocols. Join Tom Bajoras of Hybrid Arts as he unravels the intricacies of how synthesizers handle MIDI information. You'll find Tom's MIDISAVE program on your START disk.

Since its introduction in the summer of 1983, MIDI (the "Musical Instrument Digital Interface") has spread like a new religion throughout the music industry to the point where, in some trade magazines, the words "MIDI" and "music" are used interchangeably. A survey conducted recently by one of the leading music magazines reveals that 42% of its readers use personal computers in their music, and the other 58% plan to get computers sometime during the next year. Traditionalists may shake their heads in

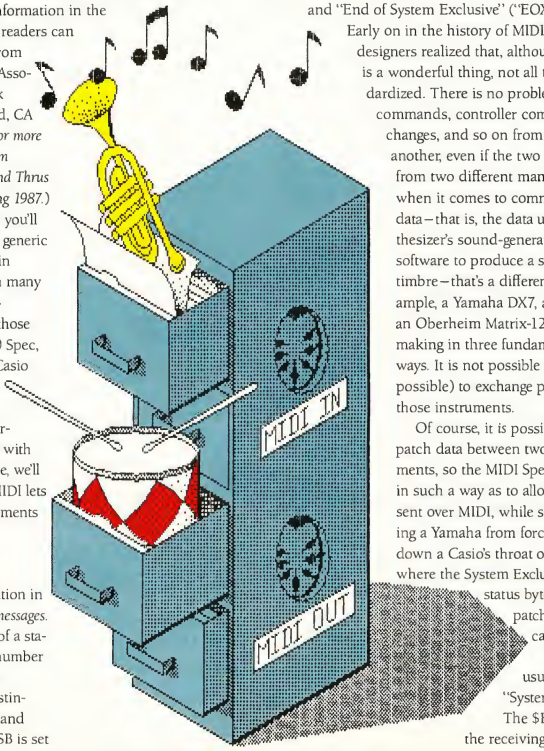
File MIDISAVE.ARC on your START disk

dismay over this state of affairs, but one thing is certain: MIDI is here to stay.

Until the Atari ST computers appeared, a musician who wanted to connect his or her computer to a synthesizer had to buy or build a MIDI interface and connect it to one of the computer's existing I/O ports. Practically all electronic musical instruments—synthesizers, drum machines, sequencers, audio processing effects, and now even mixing boards—have a MIDI interface built into them. The ST is the first computer to have a built-in MIDI interface. This, combined with the ST's outstanding graphics and processor speed, is making the ST the focus of a lot of attention from music software developers.

The success of MIDI can be attributed to its highly standardized communication protocol. A document called the MIDI 1.0 Specification (or "MIDI Spec") serves as the bible for MIDI hardware and software engineers. I don't have space here to go into all the information in the MIDI Spec, but curious readers can get a copy of the spec from the International MIDI Association, 11857 Hartsook Street, North Hollywood, CA 91607. (Editor's note: *For more on the MIDI Spec, see Tom Jeffries's "The Ins, Outs and Thrus of MIDI," START 4, Spring 1987.*)

On your START disk you'll find MIDISAVE, a MIDI generic patch librarian written in Alcyon C. It works with many different brands of synthesizers, including all those that follow the MIDI 1.0 Spec, as well as the popular Casio synths that have their own variation on the MIDI protocol. To understand why it can't work with *every* sort of MIDI device, we'll have to examine how MIDI lets different musical instruments talk to one another.



Marcus Badgley

INSIDE MIDI

MIDI transmits information in groups of bytes called *messages*. Each message consists of a status byte followed by a number of data bytes. The most significant bit (MSB) distinguishes between status and data bytes: If a byte's MSB is set then the byte is a status byte, otherwise it is a data byte. Thus, status bytes range (in hexadecimal) from $80 to $FF, while data bytes range from $00 to $7F. There is an extensive vocabulary of status bytes, each having a certain number of data bytes that must follow it. For example, the status byte $90 means "Note On on MIDI channel 1." (Channels are MIDI's way of addressing multiple instruments. Each instrument can be set to one of 16 channels. It will then only respond to the MIDI messages sent to it on the corresponding channel.) The $90 status byte requires two data bytes, so an entire Note On message looks like this:

$90 KK VV

The KK data byte is a key number, ranging from $00 to $7F, and the VV is a velocity value, also ranging from $00 to $7F.

The two status bytes of particular significance to MIDISAVE are $F0 and $F7, which stand for "System Exclusive" and "End of System Exclusive" ("EOX"), respectively.

Early on in the history of MIDI, the Spec's designers realized that, although standardization is a wonderful thing, not all things can be standardized. There is no problem sending note commands, controller commands, patch changes, and so on from one synthesizer to another, even if the two synthesizers are from two different manufacturers. But when it comes to communicating patch data—that is, the data used by the synthesizer's sound-generating hardware and software to produce a specific sonic timbre—that's a different matter. For example, a Yamaha DX7, a Casio CZ101, and an Oberheim Matrix-12 approach sound-making in three fundamentally different ways. It is not possible (and may never be possible) to exchange patch data between those instruments.

Of course, it *is* possible to exchange patch data between two identical instruments, so the MIDI Spec had to be set up in such a way as to allow patch data to be sent over MIDI, while somehow preventing a Yamaha from forcing its patch data down a Casio's throat or vice versa. That's where the System Exclusive and EOX status bytes come in. In fact, patch data is rarely called "patch data" anymore; the usual term is now "System Exclusive data." The $F0 status byte tells the receiving instrument that ▶

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IBM PC		16.9
ST BASIC		9.2
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SPEED. With an average PCW benchmark speed of 1.8 seconds, this is the fastest BASIC available (faster than any other PCW have tested) and is faster than BASIC running on the new Compaq 80386 super micro. See table for other comparisons.

EDITOR. A full GEM based scrolling editor is included. Supports search and replace, cut, copy, paste and very fast scrolling speeds. Multiple programs may be held in memory at once, and each program can have its own editing window and associated icon.

PROGRAM SIZE. There is no limit to program size, other than available memory, and there is no speed degradation for running large programs as there is on many other interpreters. Strings may be up to 64K long, arrays may be over 64K.

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GEM. Direct and full access is given to the ST graphic such as circle, arc, pie, area filling etc. In addition there is a range of keywords for controlling the menus, icons and windows. It is possible to write programs that present the user with a perfectly standard GEM type interface. An example of a complete GEM program is supplied on the example disc.

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bytes which follow (until it receives an $F7) comprise a System Exclusive data dump. Here is the format of a System Exclusive dump:

$F0 II . . . $F7

The II byte is a manufacturer's ID Number. For example, $43 means Yamaha, and $04 means Moog. When an instrument receives an $F0 it checks the next byte to see if this message has been sent from another of the same brand of instrument.

If not, the receiver ignores the rest of the message until the $F7. If the manufacturer's ID is the same as the receiver's, then usually some additional information must be supplied in the following bytes to tell whether this message has been sent from the same model number as the receiver's. Again, if this does not match, the receiver ignores the rest of the message until the $F7. The ". . ." above indicates that between the manufacturer's ID number and the EOX status byte there can be any number of data bytes. Different instruments will require a different number of bytes to describe a patch. In general, more complex instruments require more bytes. The only rule is that each data byte must be between $00 and $7F.

In its most basic form, a "patch librarian" is a program that can save and load System Exclusive data to and from a disk drive, and transmit and receive System Exclusive data over MIDI. Commercial patch librarians fall into one of two categories: *patch librarian/editors* are designed to work with a specific brand of synthesizer, and *generic patch librarians* are designed to work with a large number of different synthesizers.

MIDISAVE is in the second category. At first glance, you might wonder why someone would want a patch librarian that can work with only one brand of synthesizer. That means for each synthesizer you own, you must buy a separate program. The explanation is simple: generalization means loss of power. Dedicated patch librarians typically include powerful full-screen editors for modifying System Exclusive data. To cut costs, synthesizer manufacturers try to minimize the number of controls and indicators on their instruments' front panels. This results in more instrument for the money, but it also results in less user-friendliness. Editing a patch on a synthesizer that has only two switches and one LCD is a bit like using a word processor which allows you to see only one word at a time.

The more sophisticated patch librarian/editors provide full-screen editors plus graphical analysis of wave shapes, envelopes, keyboard scaling curves, and operator outputs. A generic patch librarian, on the other hand, cannot be so powerful, because the bytes between $F0 and $F7 cannot be assigned any meaning. You might be able to change those bytes (any decent disk utility program can do that), but you'd have to be a MIDI hacker at heart to obtain specific results.

USING MIDISAVE

MIDISAVE is a command-oriented program. Type the command after the "%" prompt, and enter it with the Return or Enter key. The Control-C command requires no [RETURN] or [ENTER].

There are only ten commands:

LIST (filenames)
LOAD filename
SAVE filename
ERASE filename
HELP
CHANNEL n
PATCH n
CLOAD filename
CSAVE filename
Control-C

Practically all electronic musical instruments—synthesizers, drum machines, and even mixing boards—have a MIDI interface built into them.

You can type in the first nine commands with any combination of lower- and upper-case letters. For example, "help", "HELP", and "HElp" are all equivalent. Control-C, of course, is just the C key pressed while you're holding down the Control key.

When the program loads, it automatically executes the HELP command.

(A) LIST (filenames)

This command lists the files on the disk. The optional (filenames) portion of the command specifies a file or group of files to be listed. Wild-card characters can be used within (filenames): "*" means any number of any characters, and "?" means any one character. Omitting (filenames) is equivalent to typing "LIST *.*".

It's also possible to list files on other than the default disk. (The "default disk" is the one from which you booted MIDISAVE.TOS.) For example:

LIST B:*.*–list all files on drive B

The LIST command will not work properly unless MIDISAVE.TOS is in the root directory.

Type Control-S to pause the output from the LIST command, and Control-Q to continue.

(B) LOAD filename

Loads a file from disk to synthesizer. To load a file from other than the default disk drive, use a drive designator prefix ("A:", "B:", etc.).

(C) SAVE filename

Saves a System Exclusive data dump from the synthesizer to a disk file. MIDISAVE will go into a wait mode until either a valid system exclusive data dump is sent to it, or you type on the ST's keyboard. Typing a key aborts the command. To find out how to send a system exclusive data dump, you will have to consult your synthesizer's owner's manual. Some synthesizers, such as Casio synthesizers, cannot send System Exclusive data from their front panel; the SAVE and LOAD commands will not work for them. However, see the CLOAD, CSAVE, CHANNEL, and PATCH commands below.

The SAVE command will fail, with an error message, if the file specified already exists on the disk. Either try again with a different file name, or erase the file and try again using the same file name.

(D) ERASE filename

Removes a specified file from the disk.

(E) HELP

Lists the ten available commands and gives a brief description of each. When you load MIDISAVE it executes the HELP command automatically.

(F) CHANNEL n

Sets the MIDI channel (n = 1-16) for subsequent CLOAD and CSAVE commands (see below). If MIDISAVE's MIDI channel number does not match the Casio's, the ST and the Casio will not be able to communicate, resulting in error messages when the CLOAD and CSAVE commands are attempted.

(G) PATCH n

Sets the source or destination patch number (n = 0-99) for subsequent CLOAD and CSAVE commands (see below). Each model number within Casio's line of CZ synthesizers uses a slightly different numbering system for patches:

- For a CZ-101 or CZ-1000: Presets 1-16 correspond to n = 0-15. Internal patches 1-16 correspond to n = 32-47. Cartridge patches correspond to n = 64-79.
- For a CZ-3000 or CZ-5000: Presets A1-D8 correspond to n = 0-31. Internal patches A1-D8 correspond to n = 32-63.
- For a CZ-1: Internal patches A1-H8 correspond to n = 0-63.
- For a CZ-230S: Internal patches 0-99 correspond to n = 0-99.

When using the patch command, keep in mind that you cannot select a preset patch as the destination for the CLOAD command. Also, Casio synthesizers other than the CZ-101 and CZ-1000 do not allow MIDI access to the cartridge patches.

(H) CSAVE filename

Casio synthesizers use a more complicated method of System Exclusive communication. A few other synthesizers, most notably certain Roland instruments, also use non-standard methods; unfortunately MIDISAVE will not work for them, although a completely professional generic patch librarian would. Casio's method involves a handshaking dialog between the synthesizer and the computer. Instead of you telling the synthesizer to dump its data by pressing a button on its front panel, you must send a "dump request" command over MIDI. The Casio then transmits the equivalent of "Are you sure you want me to dump my system exclusive data?" to which the computer must respond with a message meaning "Yes, I'm sure. Now do it!" Only then does the Casio transmit the data for a single patch. A patch number and a MIDI channel number are embedded in the dump request, so the Casio knows which patch to dump; this is why CSAVE must be preceeded by the PATCH and CHANNEL commands.

(I) CLOAD filename

The same handshaking procedure that complicates Casio-to-computer communication also complicates computer-to-Casio communication. The handshaking goes something like this: The computer asks "Do you want to receive some system exclusive data?" and the Casio responds "If you insist." Of course, the computer counters with "Of course I insist! Here it comes. . ." The transmit request includes a destination patch number and channel number.

(J) Control-C

Causes an immediate exit from the program. Warning: You will not be given a chance to change your mind!

THE PROGRAM

The only external file used by the program's source is OSBIND.H, which defines GEMDOS functions for screen, keyboard, disk, and MIDI I/O.

Ten **#define** statements define the values returned from the **getcmd( )** function. An eleventh **#define** statement defines a macro used by the parsing function.

There are four global arrays: The **cmdline[]** array contains each command line entered by the user in response to the "%" prompt. The **token1[]** and **token2[]** arrays contain the output from the parser. For example, if the user typed "Hello world", **cmdline[]** would contain "Hello world", and after parsing **token1[]** would contain "Hello" and **token2[]** would contain "world". The **filebuf[]** array contains MIDI data.

The "typedef struct dta" statement creates the data type DTAPTR returned from GEMDOS's **Fgetdta( )** function. The ▶

Synthesizer Sounds...

data type DTAPTR points to a 44-byte structure created by GEMDOS's **Fsfirst( )** and **Fsnext( )** functions.

main( )

As with any C program, execution begins with **main( )**. The **main( )** function here consists of an infinite loop. However, the **Cconrs( )** and **Cconws( )** functions intercept the Control-C command and abort from the program, giving us a "free" command to exit MIDISAVE. The **while(1)** loop branches to one of ten command handlers based on the value of the local variable cmd, and then calls function **getcmd( )** to redefine the value of cmd. At the start of **main( )** cmd is set to HELP so that on the first time through the **while(1)** loop the **do_help( )** command handler will be executed.

getcmd( )

The **getcmd( )** function first erases any previous command in the **cmdline[]** array. Then it displays the cursor at the start of the next line. Note throughout this program that every **Cconws( )** call includes the line-feed-plus-carriage-return sequence, "\n\r". Calling **Cconrs(cmdline)** fills **cmdline[]** with a new string whenever the user types [RETURN] or [ENTER]. Before calling **Cconrs( )**, the first byte in **cmdline[]** is set to 80 to tell **Cconrs( )** the maximum number of characters to accept. The prompt and input command line sequence is inside a do. . .**while( )** loop, so that entering a null command will cause an immediate prompt for another command. Once a non-null command line is entered, **getcmd( )** calls **lc_to_uc( )** to convert lower case letters in the command line to upper case. This allows commands to be typed with any combination of lower- and upper-case letters. Next, **getcmd( )** calls **parse( )** to parse the command line into two tokens. The first token is compared to each legal command string. If a match is found, the corresponding #defined value is returned. If no match is found, the BADCMD value is returned.

The ST is the first computer to have a built-in MIDI interface.

parse( )

The parsing function first erases the previous two tokens. It then searches from left to right through the command line. When a non-space is encountered it begins copying the command line into the first token. It copies until it encounters a space. Then it continues searching until it finds another non-space, at which point it begins copying the command line into the second token. It copies until it encounters either a space or the end of the command line.

do_load( )

The **do_load( )** command handler is called in response to the LOAD filename or CLOAD filename commands. First, it checks for a file name following the "LOAD" or "CLOAD" portion of the command. We open the specified file, and then we call **Fsfirst( )** to determine the file's length. A file longer than 50000 bytes won't fit into the **filebuf[]** array, so in that case we write an error message, close the file, and return to **main( )**. Otherwise, we read the file, and transmit the contents of **filebuf[]** over MIDI. Finally, we close the file and return to **main( )**.

do_save( )

The **do_save( )** command handler is called in response to the SAVE filename or CSAVE filename commands. First, it checks for a file name following the "SAVE" or "CSAVE" portion of the command. Next, we attempt to open the specified file. If this succeeds, then the file exists, and we write an error message, close the file, and return to **main( )**. This means that the SAVE command cannot overwrite a file. If we find that the specified file does not yet exist, then we create it. Next, we call **receive( )** (**c_receive( )** for the CSAVE command) to fill filebuf[] with system exclusive data. The **receive( )** or **c_receive( )** function returns the number of bytes received over MIDI. If this number is zero, then the user has opted to abort the SAVE command by typing a key on the ST's keyboard while **receive( )** was waiting for MIDI bytes. If **receive( )** returns a number greater than zero and less than 50000 then we write the contents of **filebuf[]** to the newly created file, close the file, and return to **main( )**.

do_erase( )

The **do_erase( )** command handler is called in response to the ERASE filename command. It checks for a file name following the "ERASE" portion of the command. If there is one, we delete the specified file and return to **main( )**.

do_help( )

The **do_help( )** command handler is called in response to the HELP command. A series of **Cconws( )** calls writes a summary of all available commands on the screen.

do_patch( )

The **do_patch( )** command handler is called in response to the PATCH n command. The n portion of the command is converted into a number and stored into the handshaking commands for Casio communication.

do_channel( )

The **do_channel( )** command handler is called in response to the CHANNEL n command. The n portion of the command is converted into a number and stored into the handshaking commands for Casio communication.

do_badcmd()

The **do_badcmd()** command handler writes the error message "Unrecognizable Command" for an illegal **token1**[1 returned from **parse()**.

do_list()

The **do_list()** command handler is called in response to the LIST (filenames) command. First, we check for the (filenames) portion of the command. If there is none, we use "*.*" for that portion. Next, we check for files matching the specified (filenames). If there is at least one matching file, we write that file's name. Then we loop, calling **Fsnext()** until it returns a non-zero number. Each time we call **Fsnext()** it puts another file name matching the specified (filename) into the DTA created by **Fgetdta()**.

receive()

First, we find pointers to the heads and tails of the MIDI and Keyboard input queues. When head and tail are not equal, there is a byte available from that device, and we can read it with the **Bconin()** function. Checking head against tail is faster than calling **Bconstat()**. For MIDI I/O we need to be as fast as possible, to avoid losing bytes at the end of a long System Exclusive data dump.

The **loop1** loop checks the Keyboard and MIDI input queues until either is not empty. If the keyboard queue is not empty, then we return a long zero in D0 to request an abort from **do_save()**. If the MIDI queue is not empty, we read a byte and check for $F0. We continue with **loop1** until either a key is typed or an $F0 is received. When we receive an $F0, we put it into **filebuf**[1 and set our byte count to 1. Then we start the **loop2** loop.

The **loop2** loop checks the Keyboard and MIDI input queues until either is not empty. If the keyboard queue is not empty, then we return a long zero in D0 to request an abort from **do_save()**. If the MIDI queue is not empty, we read a byte and check for $FE or $F8. The $FE status byte is called "Active Sensing," a MIDI instrument's way of saying "Here I am!" The $F8 status byte is called "MIDI Clock." MIDI drum machines and sequencers use it to synchronize themselves. For our purposes, $FE and $F8 bytes can be treated as if they do not exist. Any other status byte is converted into an EOX status byte, $F7, and terminates **loop2**. If the received byte is a data byte it is appended to **filebuf**[1, the byte count is incremented, and we continue with **loop2**.

If the byte count exceeds 49999, then we return a long 50000 in D0 to request an overflow error message from **do_save()**.

c_receive()

The **c_receive()** function is essentially the same as the **receive()** function, except that the proper handshaking for Casio communication is done first.

REVERB

As generic patch librarians go, MIDISAVE is very primitive. (I wrote it in one evening.) It can't even begin to compare with a good, full-featured generic patch librarian. On the other hand, you could pay up to $150 for some commercially-available generic patch librarians no more capable than MIDISAVE. For novice programmers, MIDISAVE demonstrates effectively the general principles of communicating over MIDI. More advanced programmers will have fun modifying the program to work with a wider range of instruments. ■

IF YOU'D LIKE TO SEE MORE ARTICLES LIKE THIS ONE, CIRCLE 182 ON THE READER SERVICE CARD

A "patch librarian" is a program which can save and load System Exclusive data to and from a disk drive, and transmit and receive System Exclusive data over MIDI.

REFERENCES

- *MIDI 1.0 Specification* from The International MIDI Association, 11857 Hartsook Street, N. Hollywood, CA 91607.
- Keyboard Magazine, January 1986 (entire issue devoted to MIDI). Any issue after 1983 of the following magazines: Keyboard, Electronic Musician, Music Technology, or Keyboards, Computers and Software.
- *The MIDI Book: Using MIDI and Related Interfaces*, by Steve de Furia with Joe Scacciaferro, published by Third Earth Productions, dist. by Hal Leonard.
- *MIDI For Musicians*, by Craig Anderton, published by Music Sales Corp., 24 E. 22nd St., New York, NY 10010.

BASICs FOR THE ST

START COMPARES FIVE

by DAVID PLOTKIN

START compares five BASICs for the ST: Atari's ST BASIC, SoftWorks BASIC, Logical Design Works Compiler, Computer Concepts' Fast ST BASIC, and MichTron's GFA BASIC—including a critical analysis of each program's features, documentation and support.

BASIC is the language of choice for many programmers and aspiring programmers. It is quick, compact, and does its job. As of March 1987 there are five BASICs available for the Atari ST computers. They are very different, and the purpose of this article is to compare their merits and drawbacks.

The first BASIC is Atari's ST BASIC, packaged free with your ST. Much has been written about this language and its shortcomings, and it is a standard of sorts: everyone has a copy, and listings you see printed in magazines are likely to be written in ST BASIC.

LDW BASIC is not really a separate BASIC at all, but a compiler for ST BASIC, and it shares many of the limitations of ST BASIC. But LDW BASIC solves the problem of ST BASIC's slow speed: LDW's compiled code is very fast. Revision 1.1, which arrived just before we went to press, includes some significant enhancements over the original version.

File BENCHMRK.ARC on your START disk

TABLE 1
BASIC COMPARISON

	ST BASIC	LDW		SoftWorks	Fast ST	GFA
Manufacturer	Atari	Logical Design Works		SoftWorks Limited	Computer Concepts	MichTron
Media	Disk	Disk		Disk	ROM Cartridge	Disk
Price	Free	$69.95		$79.97	$139.95	$79.95
GEM/TOS	GEM	GEM		TOS	GEM	GEM
License	None	Public Domain—None Commercial—$300		$25	None	None
Time (in seconds)		V.1.0.	V.1.1.			
Value of Pi	4.20	.93	1.03	2.70	1.10	.75
Sum of Sines	.30	.33	.12	1.87	.12	.14
Sum/SqRoots	.25	.08	.07	.98	.10	.10
Real Count	11.52	1.10	1.13	4.23	2.75	1.10
Int. Count	9.55	.70	.75	7.68*	2.0	.39
Gosub	1.85	.17	.18	.55	.30	.21
String Handling	1.57	.22	.25	1.28	.35	.34
Disk Access	21.52	11.25	13.22	14.67	8.65	12.58
Compile/Link	——	9:08	4:26	0:15	——	——

*SoftWorks Limited converts all integers back to floating point, so integer operations are slower.

SoftWorks BASIC is totally different from ST BASIC; I had to completely rewrite the benchmarks to test it. It is compiled and fast, as well as being portable—applications which don't use GEM or other ST-specific features will run unmodified on a Macintosh or Amiga.

Computer Concepts' Fast BASIC is the first ST cartridge BASIC. An import from England, it is without a doubt the easiest to use and most powerful of the languages I surveyed.

Finally, GFA BASIC is a German import that's powerful and very fast, but currently suffers from a poor manual. It includes a run-time package and should have a compiler available soon.

(Editor's note: *Readers may notice that Philon's FAST/BASIC-M has not been included in this comparison. At the time we prepared this article, Philon was revising their program extensively and asked that it not be included. We hope to present a review of the revised program in a future issue of START.*)

BASIS OF COMPARISON

The comparisons I make in this article are different from those you may have seen in other language comparisons, since users generally require different things from BASIC than they would of a language like C. BASIC users don't expect lightning-fast execution, though speed is important for writing complex applications. BASIC users tend to be hobbyists, not developers, and often do not have access to technical information about the machine, so special features (such as GEM) must be implemented within the language if they are to be used extensively.

BASIC users also have varying levels of experience with the language (and computers, for that matter). Documentation that is adequate for an experienced user may leave a novice totally lost. None of the manuals that come with these BASICs are designed to teach the language, but even as reference manuals they vary widely in quality and usefulness.

With all these points in mind, we will look at each BASIC: calculating speed, quality of documentation (including GEM support) and ease of use.

SPEED AND BENCHMARKS

A benchmark is a short program that performs a task on a computer; it's used to measure how fast and accurately the ▶

ST Basics...

task was performed. Benchmarks don't always test what they claim to measure, but no comparison would be complete without some measure of performance.

Benchmarks *can* measure some important features. Floating-point math and trigonometric functions are important to an engineer like me—and so is the speed penalty for using floating-point numbers instead of integers. String handling is essential for applications like telephone and address books and other mini-databases, and the time required to write large chunks of data to disk is also significant.

On your START disk you'll find four different benchmark files, because I had to significantly modify the benchmark program for the different BASICs. The changes help highlight the differences between the languages. For example, ST BASIC uses GOTOXY to position text on the screen. GFA uses PRINT AT. Two others use PRINT TAB: SoftWorks BASIC puts the y-coordinate first, while Fast ST BASIC uses the more familiar order of x-coordinate first. SoftWorks also has no screen clearing command, and instead of LPRINT you must open a channel to the printer. Fast ST BASIC has an LPRINT command, but it didn't work—I had to use the VDI function to echo screen PRINT to the printer.

String handling also had some significant differences. ST BASIC and GFA BASIC use the STRING$ command to fill a string with characters. With MID$ they can pick out a portion of a string or set the contents of a substring. SoftWorks cannot set the value of a substring using MID$, so I used substring operators instead. Fast ST BASIC has a STRING$ command, but it didn't work—and neither did setting a substring using MID$. In each case concatenation was used to build the string.

Finally, to time a benchmark, you must have access to a timer. The ST has a timer that counts in *jiffies* (60ths of a second), using the four bytes starting at $462. In ST BASIC, you can use DEF SEG and a double precision variable to read all four bytes at once. SoftWorks uses the LONG function to do the same job. Fast ST BASIC has multiple byte operators called "indirection operators," but they crash the machine, so I was reduced to using single-byte PEEKs and multiplying out the results. GFA BASIC has a built-in timer calibrated in increments of 1/200 of a second, so I had to do a conversion to get comparable times.

ST BASIC

Ah, ST BASIC. If you want to write a BASIC program that anyone with an ST can run, this is the language to use. ST BASIC is a full-featured generic BASIC that allows access to rudimentary graphics and sound. It supports random and sequential disk access and program chaining; string-handling is good, and multiple-byte PEEKs and POKEs are possible (though clumsy). WHILE and PRINT USING make structured programming and printing easier, and a full range of debugging tools including TRACE and FOLLOW are available.

However, many ST BASIC operations are *slooooow*, and in its current version there are significant bugs. The floating-point package, for example, is not particularly accurate. In fact, I have not been able to obtain satisfactory results from ST BASIC on a number of engineering calculations.

ST BASIC supports GEM only in a limited way. Some graphics and sound functions can be used with keywords, but alert and dialog boxes, menus, windows and fancy graphics are only available using POKEs and a pair of generic GEM commands, VDISYS and GEMSYS. The syntax of these commands is given in the manual, but little else; for detailed information or examples of how to use GEM calls, you will have to turn elsewhere. I think many people who purchase the ST to program it in BASIC fully expect to be able to use the GEM features in a straightforward manner; for them, ST BASIC will be a disappointment.

LDW BASIC's compiled code is very fast, and Revision 1.1 includes some significant enhancements over the original version.

DOCUMENTATION

The ST BASIC documentation includes instructions to get you started, an alphabetized list of keywords and a few sample programs. It is a good reference manual—better than I've seen with other languages—and should be adequate even if you are only moderately experienced with another version of BASIC. With some perseverance, you could learn to program in ST BASIC from it.

Listing the keywords alphabetically often gives strange results: ENDWHILE is listed before WHILE, and ELSE before IF, so the explanations of these keywords make little sense if you read the manual straight through. Atari did some rearranging, explaining some closely related keywords at the same time. Each keyword is accompanied by several short examples, which help clarify the uses for the keyword.

USING ST BASIC

Entering programs in ST BASIC is a chore. The editor consists of four different windows: EDIT, OUTPUT, LIST and COM-

MAND. These windows shift distractingly, moving in front of one another as you execute different commands. Further, changes to text in the EDIT window leaves difficult-to-read "ghost" text in its place. Having two windows, one for the program listing and one for the output, can sometimes be an advantage, but too many windows make programs slower and programming more difficult. (My article on using ST BASIC in the Winter 1986 issue of START gave some pointers on how to circumvent some of this clumsiness.)

Running a program is made simple by the fact that ST BASIC is a GEM application. Thus, attempting to load a file will bring up the familiar File Selector Box, so that you don't have to remember what files are on the disk. Pull-down menus can RUN or BREAK the program, and give easy access to the editing tools. ST BASIC is interpreted, so that you can run the program right away, make changes, check variable values, and run it again. This simplifies debugging considerably. The program, of course, runs slower than if it were compiled.

SUPPORT

Support for ST BASIC is only fair. Atari has a customer service number (408-745-2367) that may be able to answer your questions. Because ST BASIC has been widely distributed, you can probably also get answers from your local user group, a friend, or magazines like ANTIC and START. If you own a modem, you can post a notice on a bulletin board or information service like CompuServe or GEnie and get a quick answer. Atari users are well known for their willingness to help others, and I suspect this is the best support of all.

SUMMARY

ST BASIC will cost you nothing extra, and is a good learning tool, with decent documentation and widespread help available. But if extreme accuracy, speed or GEM access are very important to you, then you should probably explore another BASIC.

LDW BASIC COMPILER

The LDW BASIC Compiler is a compiler for programs written in ST BASIC that also implements a number of enhancements. A compiler converts a program into machine code, so the final result of the LDW compiler will usually run many times faster than the interpreted ST BASIC version could.

There are two reasons why many people prefer interpreters over compilers. First, a compiled program must normally be written, compiled and tested; if anything doesn't work properly (usually the case), you must go back to your original program, correct it and recompile—a process that can be very lengthy. Second, it can be very difficult to find the problem in a compiled program, since you can't just print out the values of variables to see what is going wrong. To get at variable values, you must build debugging statements into your program to print them out, then remove those statements after the program is working.

The LDW BASIC Compiler gets around these problems by compiling ST BASIC. Thus, you can write a program in interpreted ST BASIC and debug it; once everything works properly (but slowly), you can compile to produce a fast version. Although you may not get exactly what you want the first time (it may be *too* fast), the amount of back-and-forth debugging is kept to a minimum.

Since the LDW BASIC Compiler is designed specifically to compile ST BASIC, it has most of the same drawbacks, except speed. Some enhancements have been built-in: line numbers are optional, and the constraints on array and string size, as well as number of lines, have been removed; there's double-precision math, and a multiple-pairs version of LINEF lets you draw many lines using one command. Of course, since these enhancements are not available in ST BASIC, you will have to go back to the compile-debug-fix cycle if you want to use them. A very few normal ST BASIC commands *do not* work in the compiler, but they are well documented and not likely to cause trouble.

The newest version of the LDW compiler, revision 1.1, adds many new commands including some to read and set the time and date, enable and disable the break key (!Control! !C!), and enable the output window. Unlike the original version, it has no copy-protection, and it includes a variety of batch files for compiling and linking your ST BASIC program. Also available is the option to *not* produce the assembler source code, which saves a great deal of time and disk space. Using a RAMdisk or hard disk cuts the time required still further. One of the batch files for two-drive systems allows you to simply walk away and come back later to find everything done, with the .PRG file on your disk.

Another enhancement is the inclusion of GEM bindings—subroutines that do all the dirty work of calling GEM and AES for you. For example, to create an alert box you simply set two variables and GOSUB FORM_ALERT. The subroutine will even return the number of the button in the alert box you clicked on. The use of the GEM bindings is *much* more straightforward than POKEing and PEEKing in ST BASIC. The bindings are well documented, noting what variables must be set and what they are, and what special arrays must be dimensioned; the documentation includes page numbers in Atari's GEM manuals and Abacus Software's *Atari ST GEM Programmer's Reference* for finding further information. The GEM bindings will even work in regular ST BASIC programs, and they are a valuable addition to the LDW package.

DOCUMENTATION

The manual is dedicated strictly to how to use the compiler, and generally does a good job. The first section tells you what ▶

enhancements have been added to ST BASIC, and then how to actually compile a program. It is explicit about the disks you must set up and the exact steps to follow.

The balance of the manual discusses the options available during compile, and contains more details about the language implementation (such as double-precision and bugs in ST BASIC). The details tend to be overly technical and the language is often stilted—but you *can* figure out what's going on. The explanation of GEM access is no better than in the ST BASIC manual, but the GEM bindings available in revision 1.1 make GEM access easier. While the technical section will be incomprehensible to most BASIC users, you don't need this section to make the compiler package work.

USING THE LDW BASIC COMPILER

The package consists of an assembler, linker and compiler, along with the EMACS editor. If you are using straight ST BASIC code, you can just use the ST BASIC editor. If you don't want to use ST BASIC, or are going to be using some of the enhancements, I suggest you try a word processor such as 1ST Word; the EMACS editor is pretty unwieldy and entirely command driven (no GEM).

After you've created your BASIC program, you follow the manual's instructions for your system configuration. The LDW BASIC Compiler will take your BASIC source code and create assembler source code (if you choose that option), assemble to object code, link the necessary files, and modify the resulting code to make it relocatable. When the compile-(assemble)-link-RELMOD cycle is complete and you have created your final .PRG file, you can transfer it to another disk and use your working disks to compile your next effort. The working disks will fill up fast, since some huge intermediate files can be created while compiling, but most of these files are automatically erased when the program finishes.

SoftWorks

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SUPPORT

Support for the LDW BASIC Compiler is surprisingly good, both by phone (408-435-1445) and mail. LDW has mailed several bulletins to all registered owners, addressing common problems. Their enhancement policy is also fair: revision 1.1, with a brand new manual and two disks, is available for only $25 to registered users.

SUMMARY

The LDW BASIC Compiler is the only one that can compile ST BASIC. It does a good job of it, and if you have written a good (but slow) ST BASIC program, this may be what you need. The benchmark results are impressive, and with its new lower price ($60 less than the original price) it is an excellent value for those who need its unique capabilities.

SOFTWORKS BASIC

SoftWorks BASIC bears little resemblance to ST BASIC. It is a compiled BASIC, with all the inherent disadvantages compilers present for debugging. This was brought home forcefully to me when I programmed the benchmark, since it took several passes to get it to run successfully.

A SoftWorks BASIC program actually compiles to an intermediate code called *p-code*, which does not run as fast as the machine code generated by LDW, but compiles much faster. A run-time package (provided with SoftWorks BASIC) must be present on the disk for your compiled program to run. Using the compiler itself and running the compiled .RUN file was very simple, since version 2.0 supports standard GEM file selector boxes.

SoftWorks BASIC supports a fairly complete set of commands, although it is missing such advanced features as procedures, WHILE, and CASE. Many of the keywords that experienced BASIC programmers expect to find are missing or have different names, which can cause some confusion. On the other hand, this BASIC has some powerful extensions, such as mapped variables (similar to RECORD types in Pascal), substring operators, routines to move blocks of memory, and arrays up to seven dimensions. You can also do multiple-byte PEEKs much more easily than in ST BASIC.

GEM support in SoftWorks BASIC is there, but you have to know how to use it. All the special (not generic) ST GEM functions are available through the TOOLBOX command. You can use not only VDI and AES, but XBIOS and GEMDOS as well. The TOOLBOX commands mirror the C language calls closely, so if you know your way around GEM, you can construct a fully GEM-based application. The catch is, you *must* know your way around GEM; I suspect many BASIC programmers do not, and the documentation is no help. Since there is absolutely *no support* for any kind of graphics, sound, windows, alert and dialog boxes, and menus outside of the TOOLBOX command, the programmer who isn't familiar with GEM will not be able to use any of these features. This is much worse than ST BASIC, which at least lets you do some graphics and sound. The GEM-ignorant programmer will be able to produce only "plain vanilla" generic BASIC programs ▶

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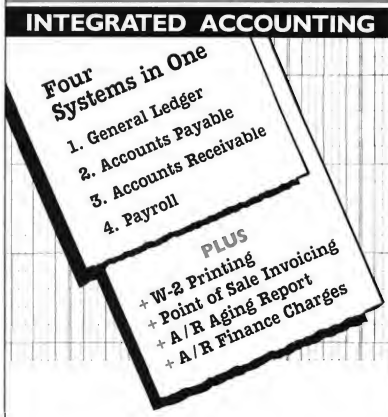

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ST Basics...

with SoftWorks BASIC. Of course, this may be all you want—it's enough for engineering problems. But even dry applications can benefit from a little spicing up.

DOCUMENTATION

The SoftWorks BASIC manual begins with four pages explaining what a program is, followed by the section on using the compiler. One place where this manual gets high marks: Instead of using strictly alphabetical listings of the keywords, they are broken up into sections such as General Statements, File I/O, and Error Trapping. Unfortunately, the explanations that accompany the keywords are quite technical, and will be difficult for the beginner to understand. In fact, the manual is called a "technical reference manual," and that is primarily what it is. I would have to categorize this as a BASIC for the moderately advanced programmer; the documentation is adequate for someone who has learned another version of BASIC.

As I mentioned before, the only access to any GEM support at all is via the TOOLBOX command. Here the manual falls down. Although the TOOLBOX command parameters are in a separate section, the descriptions are cryptic and of little help. There are no examples of how the various commands tie together to, say, open a window. Since this sort of information is currently very hard to find, the average user is left without any access to GEM.

SUPPORT

Numerous calls to SoftWorks have convinced me they are serious about their support. A programmer is available most of the time, and SoftWorks seemed genuinely interested in helping me find out why something wouldn't work. They were never condescending, although not all of their programmers are as familiar with the ST version of SoftWorks BASIC as with other versions.

SUMMARY

If you don't need any GEM support, but want speed of execution without mind-numbing compile times, this BASIC will probably fit the bill. Its GEM support may become accessible later, as the documentation for the Atari ST and GEM gets better. It is very different from any other BASIC I have used, so there is a fairly steep "learning curve" until you begin to think in this new language. (Editor's note: *For another perspective on SoftWorks BASIC, see Chris Chabris' article "Shoestring Development" in the Winter 1986 issue of START.*)

FAST ST BASIC

Computer Concepts' Fast ST BASIC is the most powerful of the currently available BASICs. It sports a tremendous number of commands, giving the user unprecedented control over the program. It is also simple to use, provided on cartridge and totally GEM-driven. The desktop includes printer, disk and clipboard icons, as well as icons for each of the up to 10 programs that can be loaded in at once. LOADing, SAVEing and PRINTing are simply matters of dragging one icon on top of another. The drop-down menus are helpfully arranged, and the arrangement of the screen makes it easy to see both the output and listing at the same time.

Fast ST BASIC comes with a powerful editor for entering programs. It includes many features found in word processors, such as sophisticated cursor control, case and letter swapping, cut and paste, search and replace, and auto-indent. There is no syntax checking when you enter a program, so debugging must take place at run-time (but Fast ST BASIC's variety of commands help with debugging). It even has a built-in assembler so that assembly language source code can be part of the program listing, and the code will be automatically assembled when you run the program.

The scope of built-in commands is impressive. Besides all the "normal" keywords you would expect to find, Fast ST BASIC allows for elements of structured programming (PROCEDURES and FUNCTIONS), advanced loop and decisions (WHILE, CASE, REPEAT), access to the system (folders, directories, time and date, drive information, screen resolution and location), single- and double-precision variables and functions, and two ways of bit-blitting. The built-in keywords for moving blocks of bits around the screen are fast and easy to use.

Fast ST BASIC also has the best GEM support of any of the BASICs. All VDI graphics are available, allowing you to put lines and shapes on the screen, set drawing mode and color, and print text using built-in commands rather than using ST BASIC's numbered calls. This BASIC even supports many of the GEM AES calls, such as alert boxes, windowing, menus, and events, although *not* dialog boxes.

There are still some bugs in Fast ST BASIC, including keywords that don't work and less crash protection than usual. The latter is probably because of the enormous power of the language. It allows you to do so much that you can get yourself into trouble! Fast ST BASIC is also very sensitive to syntax: Failing to capitalize a keyword will cause BASIC to treat it as a variable, and an extra space or semicolon in the wrong place will cause an error. There is virtually no support for sound, and only single-byte PEEKs and POKEs are allowed into system memory—the multiple byte operators will crash the machine and cannot be used to work with the more interesting memory locations.

DOCUMENTATION

Fast ST BASIC's thick manual has a section on the editor (which doesn't cover all the options), some information on variable types, and then the alphabetical listing of all keywords. No mention of strings or arrays is made, and file han- ▶

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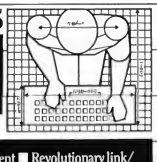

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ST Basics...

dling is left for an appendix. The explanations of the keywords themselves are pretty good, with sample program illustrations. The keywords dealing with GEM AES support are in a separate section, also arranged alphabetically. This makes little sense and I found it confusing. The AES explanations are not as complete as they could be, but are still better than any other BASIC.

SUPPORT

This is an easy one—currently, there is no support. Computer Concepts is based in England, and there is no customer support contact in the US or Canada. A program such as this one, which is fairly expensive and still has some bugs, *needs* technical support to make it a success.

SUMMARY

This is a great language to experiment with. Its implementation is extremely powerful, but is limited by the lack of support, some bugs, and the absence of a run-time package. A big plus for the "power user" is the excellent GEM support and built-in assembler.

GFA BASIC

MichTron's GFA BASIC is both powerful and very fast. It has a large number of commands—not as many as Fast ST BASIC, but GFA is not as prone as Fast ST BASIC to crash. Included with the package is a run-time version of the language, which you can give out freely so that people who do not own the language can use your applications.

GFA BASIC has two screens: one is a powerful text editor, the other is used for output from your program. The text editor's features include copy, cut, paste, find, and replace. You may enter commands using short abbreviations, and the editor will print out the commands on the screen in their entirety when you press [Return]. Syntax checking is immediate, as in ST BASIC, and there is also a command to check the structure of loops. The text editor does not use drop-down menus, but does have commands across the top of the screen that you can click on with the mouse. You can also use keyboard commands.

The text editor indents lines automatically when they are within a loop or Procedure, so that you can easily tell where the bounds of the loop are. It even lets you switch into the high resolution mode where 48 lines of text will fit on one screen. GFA BASIC uses labels instead of line numbers. Because of the two screen set-up, you can switch back and forth between your listing and the output whenever you like.

All standard features of BASICs are well represented. You also have some powerful extras, such as DO/LOOP, REPEAT/UNTIL and WHILE/WEND (but no CASE statement). You have access to a timer, and to the system time and date; you can define your own functions and procedures with local variables. Bit blitting via both built-in commands and the GEM BitBlt is supported.

GFA BASIC offers quite a bit of GEM support, although not as much as Fast ST BASIC. Commands for graphics shapes, fills, colors, text and markers are all built into the language. Full mouse control, including coordinates and condition of the mouse buttons, and the ability to set the shape of the mouse pointer are available. You can build and install your own menus, control various aspects of any of four different windows, and detect most important occurrences (keyboard input, mouse position, GEM messages and menu selection). There is even support for Alert boxes, although not for Dialog boxes. You can access VDI and AES by numbered calls for any function not supported, as in ST BASIC. You use XBIOS and BIOS functions the same way.

The windowing system is a little clumsy, and the GEM support is not as effective as it could be because the documentation doesn't provide enough information. There are also some minor bugs in GFA BASIC—for example, PRINT USING doesn't work properly under certain circumstances.

DOCUMENTATION

GFA BASIC comes with a thick manual that launches straight into the editor, and then proceeds to document the commands in alphabetical order. A few notes about such important matters as variable types are not included until the very end, leaving you somewhat confused when those variable types show up in the main body of the documentation. Some items, such as arrays, are not mentioned at all.

The manual is also laced with typographical errors and language that is incomprehensible in some places and just too technical in others. MichTron assures me that the manual is being completely rewritten to correct the language and typos. Each keyword is accompanied by an example, which goes a long way toward clarifying how the command works. Unfortunately, even these examples have typos. The explanations accompanying some of the GEM features (such as windows and messages) are extremely sketchy and will likely not be of much use to anyone but an experienced GEM programmer. Perhaps the manual rewrite will correct this as well. There are only a very few example programs on the disk, and one of these is not complete—several procedures are missing.

SUPPORT

GFA BASIC was created in Germany, but support is provided by MichTron. A programmer at their offices answers questions, and the support seems to be pretty good, especially for a product as new as this one.

SUMMARY

GFA BASIC is very fast and easy to use, due to its editor and variety of commands. It is really not for the inexperienced, ▶

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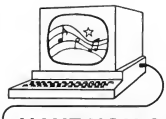

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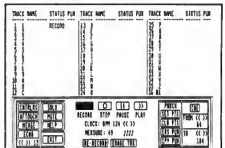

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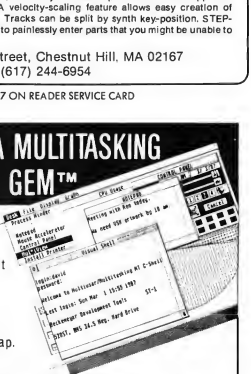
CIRCLE 017 ON READER SERVICE CARD

AT LAST . . . A MULTITASKING INTERFACE TO GEM™



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MT C-Shell system	$129.95
VSH Manager	$34.95
On-Line Manual	$19.95

CIRCLE 010 ON READER SERVICE CARD

ST Basics...

and some important information is missing from the current version of the manual. If you are mildly proficient in another BASIC, though, you will enjoy using this powerful version. The presence of the run-time package will also allow distribution of your efforts. A compiler will be available by the time you read this.

CONCLUSIONS

Of the five BASICs we have looked at, three are interpreted (ST, GFA and Fast ST), and two are compiled (LDW and SoftWorks). Each has its advantages and disadvantages; what is right for you depends on your needs. If you are a hacker/experimenter or advanced user, Fast ST BASIC is fast and very powerful. If speed is very important and GEM is not, SoftWorks BASIC could fill your needs. If speed *and* some GEM support are necessary, GFA BASIC is it. If you are a beginner, need only limited GEM functions and/or lots of support, the ST BASIC you already own may be ideal. If speed of final execution becomes a problem, that can be solved by the LDW BASIC Compiler.

GEM SUPPORT

One of the most important things to ST programmers is how well the language they use supports such GEM functions as windows, alert boxes and menus. After all, these program aspects give your creation the look and feel of a GEM-based application. To be perfectly honest, none of the languages I've surveyed here does as good a job of GEM support as, say, Personal Pascal. But let's look at what it takes to open a full-screen window with custom title and display an alert box. This will give you an idea of the quality of GEM support you are getting with each BASIC.

First we'll look at ST BASIC. Opening a custom window in ST BASIC is not something I want to even think about, so we'll just expand the output window to full screen:

```
10 fullw 2:clearw 2:REM expand and clear the window
20 POKE SYSTAB+24,1:a#=gb : REM change the title
30 gintin=PEEK(a#+8):POKE gintin,PEEK(systab+8)
40 POKE gintin+2,2:s#=gintin+4
50 DIM title$(20):title$="My window"
60 POKE s#,VARPTR(title$):GEMSYS(105):POKE
systab+24,0
70 DIM Alerttext$(50):icon=2:default=1:REM the alert
box
80 Alerttext$=Str$(icon)+"[A Sample:Alert Box|[OK:NOT
OK]"
90 gintout=PEEK(a#+12):n#=PEEK(a#+16):POKE
gintin,default
100 POKE n#,VARPTR(Alerttext$)
110 GEMSYS(52):Choice=PEEK(gintout)
```

The LDW Compiler uses the same code.

Moving on to SoftWorks BASIC:

```
Toolbox ApplInit,ld
Toolbox Grafhandle,wchar,hchar,wbox,hbox,physhandle
Toolbox WindGet,0,4,xdesk,ydesk,wdesk,hdesk
DIM workin(10),workout(57),title$(20):title$="My
window"
FOR i=0 TO 9:workin(i)=0:NEXT i
workin(10)=2:handle=physhandle
Toolbox Vopnvwk,workin,VARPTR(handle),workout
Toolbox Windcreate,15,xdesk,ydesk,wdesk,hdesk,
windhandle
Toolbox Windset,windhandle,2,VARPTR(title$),return
Toolbox Windopen,windhandle,xdesk,ydesk,wdesk,hdesk
Toolbox VSFColor,windhandle,0,setcolor
Toolbox VSFinterior,windhandle,2,setstyle
Toolbox VSFstyle,windhandle,8,setstyle
DIM temp(3):temp(0)=xdesk:temp(1)=ydesk
temp(2)=xdesk+wdesk:temp(3)=ydesk+hdesk
Toolbox Vbar,windhandle,temp
DIM Alertstring$(30):Alertstring$="[2][A
sample:Alertbox|[Yes:No]"
Toolbox FormAlert,1,Alertstring$,exitbutton
```

Not too straightforward, is it?

Fast ST BASIC makes quick work of the job:

```
CLS: SETWINDCOORS OUTHANDLE,0,0,
SCREENWIDTH,SCREENHEIGHT
RESERVE mytitle%,80:{mytitle%}$="Sample window"
SETWINDTITLE OUTHANDLE,mytitle%
button=ALERT("[2][This is a:sample alert|[yes:no]",1)
```

As you can see, this last is pretty simple, and easy to read as well.

Finally, there is GFA BASIC:

```
Fullw 2
Titlew 2,"Sample Window"
Alert 2,"This is a:sample alert",1,"yes:no",button
```

As you can see, for the GEM items GFA supports, usage is very simple. ■

Finally, remember that you are not locked in to using BASIC. There are many other languages available for the ST, each with inherent advantages and disadvantages. Determine what's best for your needs and shop around. I hope my overview of BASICs for the ST will help you make an informed choice. ■

IF YOU'D LIKE TO SEE MORE ARTICLES LIKE THIS ONE, CIRCLE 173 ON THE READER SERVICE CARD

ST BASIC
Atari Corporation
1196 Borregas Avenue
Sunnyvale, CA 94086
(408) 745-2000
Disk—Free

CIRCLE 174 ON READER SERVICE CARD

LDW Compiler
Logical Design Works
780 Montague Expressway #205
San Jose, CA 95131
(408) 435-1445
Disk—$69.95

CIRCLE 175 ON READER SERVICE CARD

Fast ST BASIC
Computer Concepts
Gaddesden Place, Hemel Hempstead
Hertfordshire, England HP26EX
Cartridge—$139.95

CIRCLE 176 ON READER SERVICE CARD

SoftWorks BASIC
SoftWorks Limited
2994 N. Broadway
Chicago, IL. 60657
(312) 975-4030
Disk—$79.95

CIRCLE 177 ON READER SERVICE CARD

GFA BASIC
MichTron Inc.
576 South Telegraph
Pontiac, MI 48053
(313) 334-5700
Disk—$79.95
Compiler—$79.95

CIRCLE 178 ON READER SERVICE CARD

ATTN: PASCAL USERS

MODULA-2
the successor to Pascal

FOR ATARI 520ST

- FULL interface to GEM DOS, AES and VDI
- Smart linker for greatly reduced code size
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- FileSystem, RealInOut, LongInOut, InOut, Strings, Storage, Terminal
- Streams, MathLib0 and all standard modules
- Directory search paths
- Supports real numbers and transcendental functions ie. sin, cos, tan, arctan, exp, ln, log, power, sqrt
- 3d graphics and multi-tasking demos
- CODE statement for assembly code
- 370-page manual
- Installs on Hard disk and RAM disk
- No royalties or copy protection
- Phone and network customer support provided

Pascal and Modula-2 source code are nearly identical. Modula-2 should be thought of as an enhanced superset of Pascal. Professor Niklaus Wirth (the creator of Pascal) designed Modula-2 to replace Pascal.

Added features of Modula-2 not found in Pascal

- CASE has an ELSE and may contain subranges
- Programs may be broken up into Modules for separate compilation
- Machine level interface
  - Bit-wise operators
  - Direct port and Memory access
  - Absolute addressing
  - Interrupt structure
- Dynamic strings that may be any size
- Multi-tasking is supported
- Procedure variables
- Module version control
- Programmer definable scope of objects
- Open array parameters (VAR r: ARRAY OF REALS;)
- Elegant type transfer functions

Ramdisk Benchmarks (secs)	Compile	Link	Execute	Optomized Size
Sieve of Eratosthenes:	6.2	4.3	3.5	2600 bytes
Float	6.4	4.8	8.3	4844 bytes
Calc	5.5	4.2	3.3	2878 bytes
Null program	5.1	3.2	—	2370 bytes

```
MODULE  Sieve;
CONST   Size = 8190;
TYPE    FlagRange = [0..Size];
        FlagSet = SET OF FlagRange;
VAR     Flags: FlagSet;
        i: FlagRange;
        Prime, k, Count, Iter: CARDINAL;
BEGIN   (*$S-,$R-,$A+ *)
  FOR Iter:= 1 TO 10 DO
    Count:= 0;
    Flags:= FlagSet{}; (* empty set *)
    FOR i:= 0 TO Size DO
      IF (i IN Flags) THEN
        Prime:= (i * 2) + 3; k:= i + Prime;
        WHILE k <= Size DO
          INCL (Flags, k);
          k:= k + Prime;
        END;
        Count:= Count + 1;
      END;
    END;
  END;
END Sieve.
```

```
MODULE Float;
FROM MathLib0 IMPORT sin, ln, exp,
                     sqrt, arctan;
VAR x,y: REAL; i: CARDINAL;
BEGIN (*$T-,$A-,$S-*)
  x:= 1.0;
  FOR i:= 1 TO 1000 DO
    y:= sin (x); y:= ln (x); y:= exp (x);
    y:= sqrt (x); y:= arctan (x);
    x:= x + 0.01;
  END;
END float.
```

```
MODULE calc;
VAR a,b,c: REAL; n, i: CARDINAL;
BEGIN (*$T-,$A-,$S-*)
  n:= 5000;
  a:= 2.71828; b:= 3.14159; c:= 1.0;
  FOR i:= 1 TO n DO
    c:= c*a; c:= c*b; c:= c/a; c:= c/b;
  END;
END calc.
```

Product History

The TDI Modula-2 compiler has been running on the Pinnacle supermicro (Aug. '84), Amiga (Jan. '86) and will soon appear on the Macintosh and UNIX in the 4th Qtr. '86.

Regular Version $79.95 Developer's Version $149.95 Commercial Version $299.95
The regular version contains all the features listed above. The developer's version supplies an extra diskette containing a symbol file decoder – link and load file dissassemblers – a source file cross reference – symbolic debugger – high level Windows library Module – Ramdisk and Print Spooler source files – Resource Compiler. The commercial version contains all of the Atari module source files.

Other Modula-2 Products

Kermit	– Contains full source plus $15 connect time to Compuserve.	$29.95
Examples	– Many Modula-2 example programs to show advanced programming techniques	$24.95
GRID	– Sophisticated multi-key file access method with over 30 procedures to access variable length records.	$49.95

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Telex: 888442 Compuserve Number: 75026,1331

CIRCLE 055 ON READER SERVICE CARD

ESCAPE FROM THE DESKTOP

IBM-TYPE COMMANDS FOR YOUR ST

by Jeffrey R. Wilson

Tired of the ease and convenience of your ST's mouse-and-menu interface? Wishing for the power and complexity of an IBM-style command line? Now you can have the best of both worlds! START's CLI is a desk accessory that gives you a command-line interpreter at the click of a mouse. It's fast, it's compact, and it's on your START disk.

Ever since the Commodore Amiga appeared, I have envied some of its features. In particular, I appreciated the ability to create a command line and access disk and other utilities while in the middle of a program, and I missed that convenience on my Atari ST.

Desk accessory programs have appeared for the ST that allow access to disk utilities, but not much else—and the amount of memory they require is enormous in relation to what they actually offer. As a result, the cost in overall system performance for these utilities has been high. Dissatisfied with this situation, I created a new desk accessory: the Atari Command Line Interpreter (CLI).

File CLI.ARC on your START disk

BY YOUR COMMAND

A command line interpreter is something of a throwback if you're accustomed to a mouse-and-menu operating system like GEM. With a CLI, the computer doesn't show you menus, windows and icons you can manipulate with a mouse. Instead, it presents you only with a prompt that tells you what the current disk drive is; you must enter each command from the keyboard. In short, a CLI makes your computer act less like an ST and more like an IBM—which some people prefer.

The Atari CLI is a desk accessory that gives you access to many of the operating system's functions, including disk cataloguing, batch file processing, and a complete selection of file utilities. To perform a function, you just type a command, along with any parameters it may require. For example, to find out what's on a disk under GEM you use the mouse to double-click on the disk's icon. To do the same thing under the CLI, you can type the command DIR, which will list the contents of the current disk.

The CLI has 58 internal commands, including several duplicates to shorten

the learning curve and make the commands more intuitive. In addition, you can run many programs from the CLI simply by typing a program's filename. A complete description of the internal commands and how to use them appears at the end of this article; you can also get a list of the commands by typing HELP at the prompt.

CLI makes your ST act more like an IBM which some people prefer.

Since it is written totally in assembly language, CLI takes up less than 10K of RAM when it's not being used. All the features are quick and efficient, and little overhead is required, as all functions tie directly into the operating system. While this utility program may not fill all your needs and desires, it should provide many of the features you're likely to need at a moment's notice on the ST.

USING CLI

To GEM and all GEM-based programs, the CLI is an ordinary desk accessory. It is loaded automatically as part of the normal boot process, and remains dormant until you select it from the menu bar. Once selected, it immediately requests 33K for a CLI screen. If that much memory isn't available, an alert box informs you that there's insufficient memory for the CLI, and control immediately returns to the current application. Otherwise, CLI clears the memory for the screen. Next, the program checks for a prompt configuration file on disk; if it finds one, the prompt is modified according to its contents. The CLI then checks for the autorun batch file, C:\CLI.BAT. If found, it is executed to completion. Finally, the program prompts you for input.

When you enter a command it is converted to uppercase, and checked against a table of internal commands. If the command is found, the associated routine is executed. If not, CLI treats the command as a filename (appending .PRG to it if the filename doesn't have an extension) and tries to run it as a program. In that case, any additional parameters on the command line are passed to the executed program in the command tail.

When either the internal command or the external program has finished running, CLI will once again prompt you for input. This process continues until you leave the CLI with the BYE or QUIT command, at which point control returns to the current application. Only batch file execution modifies this chain of events. When a batch file is running, CLI gets its commands from the text file you specify in the BATCH command.

External commands should be limited to TOS applications, as GEM applications assume a certain environment that may not exist when executed from the command line. Also, be careful when executing an external program while a GEM application is running. If you would like to execute a particular external program from within another program, first try the combination when there is no danger of losing long hours of work. While you'll rarely have problems starting the external program, the operating system can sometimes forget where to return in the original program. It's always safest to stay with internal commands while another program is running. If you want to add a routine to the list of internal commands, you'll find it's a very simple process that is fully documented in the source file.

BATCH, BATCH, BATCH. . .

During batch file processing, the CLI reads command lines from a text file that has been prepared specifically for this purpose. The program opens the specified batch file, then reads commands from the file one at a time and executes each one as if it had been typed directly from the keyboard.

Each BATCH command can take parameters to modify the commands in the batch file; you specify the parameters on the command line, right after the batch file's name. Each parameter gets a number, and is inserted into the batch file's commands as they are executed.

For example, suppose the batch file FOOBAR.BAT consists of three commands:

```
SHAKE %3
RATTLE %2
ROLL %1
```

If you use the command BATCH FOOBAR MOE LARRY CURLY, CLI will execute these three commands:

```
SHAKE CURLY
RATTLE LARRY
ROLL MOE
```

CLI takes up less than 10K of RAM when it's not being used.

The first parameter, MOE, replaces each occurrence of '%1' in the batch file; the second parameter, LARRY, replaces each '%2', and the third parameter, CURLY, is inserted each time '%3' appears.

You can specify up to nine parameters. The first nineteen characters in each parameter are significant; ▶

any additional characters will automatically be truncated. If a parameter specified in the batch file has not been defined in the BATCH command line, nothing will be inserted into the command. Batch files are fully recursive, and may be nested up to eight levels deep. If you need more levels, just reassemble the CLI with more stack space allocated. During batch file processing, pressing the UNDO key will stop execution of the current batch file and return you to the prompt.

If the batch file CLI.BAT exists in the root directory of drive C, it will automatically be executed each time the CLI is requested from the menu bar. You can use this feature to create a customized desk accessory or initialize the CLI to your favorite configuration.

The CLI principle is simple, but I continue to be amazed at how useful this command line interpreter really is. Very few GEM-based programs have more disk utilities than the ability to delete a file, and some don't even have that much. If you've used command line-style operating systems before—or even if you haven't—it's very convenient and incredibly useful to have such a wide variety of utilities available at your fingertips. Try it, and you'll see what I mean! ■

IF YOU'D LIKE TO SEE MORE ARTICLES LIKE THIS ONE, CIRCLE 184 ON THE READER SERVICE CARD.

Internal CLI Commands

—

Execute the specified batch file. See BATCH.

BATCH

Start batch file processing at the specified batch file, and save any specified parameters for insertion where designated in the batch file by '%n'. See the article for more specifics on batch file processing. The file C:\CLI.BAT is the autorun batch file. If this file exits, batch file processing will automatically be invoked on this file when the CLI is requested from the menu bar.

batch make test1 test2	Begin batch file processing on the file MAKE.BAT, assigning %1 to 'test1' and %2 to 'test2.'

BYE

Exit the CLI, return control to the current process. See EXIT.

CAT

Show a quick catalog of the specified path, or of the current path if no path is specified. A quick catalog includes directory entries, as well as all normal files. Wildcards may be used to specify exactly what files should be displayed. During the display, any keypress will toggle a pause; the UNDO key will abort the catalog.

cat *.asm	Display a quick catalog of all files at the current path with the extension .ASM.

CATALOG

Show a long catalog of the specified path, or of the current path if no path is specified. This command is identical to the quick catalog command CAT, with the exception that files with a hidden or system attribute are also displayed. Additionally, the long catalog displays information about memory usage on the disk which has been cataloged.

catalog c:	Display a long catalog of the root directory of the disk in drive C:.

CDIR

Change the current pathname to any valid GEM pathname. This command will not change the current drive, only the path associated with that drive.

cdir ..	Back up one subdirectory in the path associated with the current drive.

CLS

Clear the CLI screen.

cls	The screen is cleared.

COPY

Copy the specified file to the specified location. Wildcards are permitted, but no prompting is done. If no destination is specified, the files will be copied to the currently active path.

copy *.asm c:	Copy all files with the extension .ASM at the currently active path to drive C:.

DELETE

Remove the specified file from the disk. Wildcards may be used, but no prompting is done.

delete text.bak	The file TEXT.BAK is deleted from the current disk.

DIR

Display a short directory to the current output device. See CAT.

DIRECTORY

Display a long directory to the current output device. See CATALOG.

ECHO

If no parameter has been specified, toggle the echo state for batch file processing. Otherwise, turn the toggle state ON or OFF as indicated. If echo has been disabled, the commands read from the batch file will not be shown on the screen.

echo on	Turn on echo.

ERASE

Delete the specified file from the disk. See DELETE.

EXIT

Exit the CLI, return control to the current process.

exit	GEM application is restored.

FLASH

Set the cursor flash rate. If no parameter is specified, it will be interpreted as FLASH 0, or turn off cursor flash. If a numerical parameter is passed, it will be used as the value for the flash, or the number of 60ths of a second (70ths on a monochrome monitor) before the cursor will flash. This command will change the cursor for all subsequent TOS applications that do not reset the flash rate.

flash 60	Cursor flash is set to 1 / second.

FORMAT

Initialize a disk for use. The default setting is to initialize the disk in drive A:, single-sided, nine sector format. By adding several switches, these default settings may be changed. The switches are defined as follows:

- B Initialize the disk in drive B:, instead of the disk in drive A:.
- D Initialize the disk in double-sided format, instead of single-sided format.
- T Initialize the disk in ten sector format, instead of nine sector format.

Any switch desired is listed after the format command. Before the format is actually performed, all settings are displayed, along with a confirmation prompt. To start the format, the letter 'F' must be pressed. The progress of the format is displayed graphically.

format bdt	Initialize the disk in drive B:, double-sided, ten sector format.

FREE

Show the amount of free memory available to a program. Both the amount available to an external command run from the CLI and the amount of memory available to the current process outside the CLI are displayed.

free	Amount of memory is displayed.

HIDE

Hide a file from GEM. This will prevent a file from being displayed by either the desktop or the GEM input selector box. However, the file can still be read from and written to by GEM applications, provided the name is known.

hide prompt.cnf	Prevent GEM from seeing the file PROMPT.CNF.

INIT

Format a disk for use. See FORMAT.

LOCK

Prevent the specified file from being deleted or written to. Wildcards may be used.

lock *.asm	Lock all files with the extension .ASM at the current prefix.

MEM

Display the amount of free memory. See FREE.

MKDIR

Create the specified subdirectory or folder.

mkdir auto	Creates the subdirectory AUTO.

MODEM

Make the RS-232 port the currently active output device. This is used to direct output to a modem. If no parameters are specified, all output is redirected until specifically redirected again. If anything is specified, the parameters are considered as an independent command line with the results being redirected to the RS-232 port. In this latter case, the output is only redirected to the RS-232 port for the duration of the command, after which output direction will be restored to its former status.

modem type readme.doc	Send the contents of the file README.DOC to the RS-232 port.

PATH

Change the path for the currently active disk. See CDIR. ▶

ESCAPE...

PAUSE

Wait for a keypress. This is used when a batch file should be temporarily suspended pending some action by the user.

pause	All processing is suspended until a key is pressed.

PRINT

Make the parallel port the currently active output device. This is used to direct output to a printer. If no parameters are specified, all output is redirected until specifically redirected again. If anything is specified, the parameters are considered as an independent command line with the results being redirected to the parallel port. In this latter case, the output is only redirected to the parallel port for the duration of the command, after which output direction will be restored to its former status.

print	All further output is done to the printer through the parallel port.

PROMPT

Configure the prompt according to the parameters specified. The new configuration is saved to drive C:. Any of the VT52 commands may be incorporated, by using the '#' character in place of the escape. Certain additional commands are also added for convenience. The command list is as follows:

##	Insert the '#' character into the prompt.
#A	Move the cursor up one line.
#B	Move the cursor down one line.
#C	Move the cursor right one character.
#D	Move the cursor left one character.
#E	Clear the screen and home the cursor.
#F	Perform a line feed.
#H	Home the cursor.
#I	Cursor up one line with scroll.
#J	Clear from cursor to end of screen.
#K	Clear from cursor to end of line.
#L	Insert line and scroll.
#M	Delete line and scroll.
#P	Display the currently active prefix.
#S	Show current date.
#T	Show current time.
#Yrc	Position the cursor to row r and column c.
#br	Set character color to color register r.
#cr	Set background color to color register r.
#d	Clear from top of screen to cursor.
#e	Enable cursor.
#f	Disable cursor.
#j	Save cursor position.
#k	Move cursor to saved position.
#l	Clear line and move cursor to column 0.
#o	Clear from start of line to cursor.
#p	Reverse video on.
#q	Reverse video off.
#v	Automatic overflow on.
#w	Automatic overflow off.

prompt #b1#P#b2 >#b3	Prompt is configured and saved to drive C:.

PROTECT

Prevent the specified file from being deleted or written to. See LOCK.

QUIT

Exit the CLI, return control to the current process. See EXIT.

REM

Allows insertion of comments into a batch file. Does nothing more than echo the parameters on the command line to the screen, if echo has not been turned off.

rem hello	Prints hello if echo is active.

REMOVE

Deletes the specified file from the disk. See DELETE.

RENAME

Renames the specified file to a new name. If a preceding path is required to locate the file to rename, a matching path must precede the new filename.

rename wind.c window.c	Change the name of the file WIND.C to WINDOW.C.

RMDIR

Deletes the specified subdirectory or folder from the disk. An error will occur if the subdirectory is not empty.

rmdir auto	Removes the subdirectory AUTO from the disk.

SCREEN

Make the screen display the currently active output device. This is used to restore output direction after a MODEM or PRINTER command.

screen	All further output is done to the screen.

SYSTEM

Set the system flag of the specified file. Wildcards may be used.

system boot.sys Make the file BOOT.SYS a system file.

TYPE

Display the specified file to the currently active output device. This will dump the contents of a file to the screen, or to the printer or modem if the output has been redirected. If the UNDO key is pressed, the dump will be aborted. If any other key is pressed, the dump will be paused. Press any key to resume the dump.

type readme.doc Print the contents of the file README.DOC (at the current prefix) to the current output device.

UNHIDE

Remove hidden status of the specified file. Wildcards are permitted.

unhide prompt.cnf Make the file PROMPT.CNF visible to GEM.

UNLOCK

Remove write lock from the specified file. Wildcards are permitted.

unlock safe.txt Clear the write protect flag for the file SAFE.TXT.

UNPROTECT

Remove write lock from the specified file. See UNLOCK.

UNSYSTEM

Remove system status of the specified file. Wildcards are permitted.

unsystem *.sys Clear the system flag for all files ending with a .SYS extension.

VERSION

Show the starting prompt, with copyright information and version number.

version Show version information.

A: through P:

Change the prefix to the specified drive. This is the only way to change the default drive.

b: Make drive B: the current drive. ■

CLIPBOARD

ou say you've finally gotten windows opening and closing properly on the desktop, but can't seem to get any text printed inside one? Normally when you use C **printf( )** prints text to the screen. However, the ST's OS has two distinctly different sections handling text input and output. When printing text inside windows, remember the windows are GEM based, so you'll need to use the GEM-based text output command **v_gtext( )**. When printing strings through TOS, however, **printf( )** works fine. There's also **Cconws( )**, which operates closely to **printf( )**, and **Bconout( )**, which will output individual characters.

f you plan to open up your 520ST, to upgrade memory or make other hardware changes, be warned! Not only will you void your warranty, but you have a chance of damaging your ST's plastic case. There are six screws which hold the ST case together: three along the back and three along the front. The front screws are *slightly* smaller than the rear ones. If you screw the rear screws into the front holes, there is a good chance the screw points will pop out of the *top* of the ST case, right where your hands rest while you type. Be careful!

eed to detect which Function Key you've hit? How about detecting if the [RETURN] key or the [ENTER] key was selected? Easy. If you're not using GEM, use *Bconstat(2)* and *Bconin(2)*. *Bconin(2)* will return a 32 bit value, with an ASCII value in the low 8 bits of the lower 16 bits and a **scancode** in the low 8 bits of the upper 16 bits. In case the ASCII value is identical for different keystrokes, like [RETURN], [ENTER] and ^M, the scan code will distinguish them. Function keys have an ASCII value of zero, but have unique scan codes, which may be found in your GEM documentation.

(Editor's note: Got an ST trick or tip to share? Send it to START, attention CLIPBOARD.) ■

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DON'T FORGET!

Advertising Deadlines—Fall Issue

Insertions: June 26

Artwork: July 3

On sale: Last week of August

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GREAT SOFTWARE
from across the pond

Leisure Software — ATARI ST ™ — Professional Software and Utilities.

ST Karate★ $29.95

The ultimate martial arts game for the Atari ST. 1 or 2 player options with multiple opponents, digitized sound and unbelievable graphics. Joystick control gives 16 possible super-fast movements. A must for the serious games player.

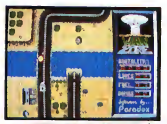
New! METROPOLIS★ $24.95

A fast action shoot-em-up with high speed lazer canons, smart bombs and 360 movement. Steer your craft around the amazing and colourful city ridding it of the usual barrage of hi-tech aliens. The one way streets, crossfire and road blocks will ensure you don't get through... well maybe!

WANDERER★

3D Stereo $39.95

Unbelievable! The first ST arcade in full stereo 3D! Live out a fantastic interplanetary adventure experiencing amazing 3D sensations with the special glasses supplied with the game. Wanderer takes you on a high speed mission through space, with the action punctuated only by rounds of amazing intergalatic pokerl. A definite must!



FIRE BLASTER★ WAR ZONE★

midi music 2 Disks

$34.95

Amazing value! Two disk pack with two full colour ST arcade games! Fireblaster is the ultimate shoot-em-up with whole screen movement, multiple ships and over 35 levels. War Zone is a futuristic tank simulation with multiple features. An amazing pack for shoot em-up fans.

ST PROTECTOR★ SPACE STATION★

midi music 2 Disks

$34.95

Another super value two disk, two game pack! Space Station is a colourful and fantastic ST platform game with layer upon layer of hidden depths. Your task of cleaning up the station is helped by your ability to shoot, jet pack and teleport to new and undiscovered areas. Protector is a full colour "defender" style game with multiple screens and fast action.

FLASH CACHE FLASH BAK

$79.95 GEM

This is one of the best hard disk utility packages available. Flash cache offers selective ram disk caching to increase your hard disk performance by up to 50%. Also included is a complete solution to the GEM 40 folder bug and the facility to password protect a disk partition. Flash-Bak is a fully featured hard disk backup utility with compression, encryption, wildcards and many auto disk features. Flash-Bak offers real performance with an amazing 1MB+ per minute backup to floppy disk! Full fact sheet available.

pro midi interface designer $99

includes 8 bit sound digitizer and version GEM

Quite simply the ultimate in sound control on your ST! A colourful VCR style interface ensures that anyone can use this program and be creating fantastic sounds within minutes. Full control over the AY-3-8910 sound chip is provided (with support for your own programs) as well as a superb 8 bit digitizer that allows you to playback samples from within your own programs. The sound sample editor is a dream! Demo disk available for $5.

BACK PAK

$79.95 GEM ROM

Back-Pack is an ST ROM containing nine powerful desk accessories without using up RAM. Back-Pack contains a Printer Buffer, Address Book, Mini Clock, RAM disk, Diary, Notepad, Typewriter, Alarm Clock and a powerful scientific calculator. A full fact sheet is available for this amazing program.

pro sprite designer $59.95

This fully featured sprite and animation designer is the easiest and fastest way to create animations on the ST. Control routines are included for Basic, C and Assembly language. This is quite simply one of the best animation designers available. If you don't believe us send $5 and we will send you an unbelievable demo!

SPOOK

The eldersoft extravaganza

$19.95

This two disk set contains two ST arcade games* including a super 3D pac man called Spook, demos, desktops and utility programs. It comes in a super shrink wrap pack with posters, fact sheets, stickers and a host of other goodies. Excellent value!!

midi comm

$39.95 GEM

Mini Comm is a complete communications package as a GEM desktop accessory! Mini Comm is fully featured and supports most protocols. Mini Comm has a telephone book, macro language, powerful redialer, call cost calculator and a host of other features. The real power of Mini Comm is its ability to work in the background, which includes the facility to do **background downloading!** Full fact sheet available.

Tempus

$49.95

The Professional Editor GEM

Tempus is the ultimate text editor for programmers. Up to four windows of text can be manipulated at high speed. Support is given for structured programming layout and the package comes complete with a fully fledged programmers calculator, among a host of other features. Tempus is one of the fastest text editors available (c1000 search and replace per second) and is extremely comfortable to use. We can provide a non refundable try-before-you-buy version for $7.50.

To order or request product information please telephone

1-412-947-3739

VISA MasterCard

or write to the address below.

Eldersoft USA Inc
PO Box 288
Burgettstown PA 15021

PA residents add 6% sales tax.

EIDERSOFT
T·R·I·A·N·G·L·E
SOFT INNOVATION
Paradox

Shipping Into: Continental US free: Add $3 for COD
Paying Into: Credit Card (no surcharge), cashier check or money order.

★ colour only. GEM is the trademark of Digital Research Inc. ST and Atari are the trademarks of the Atari Corporation.

DEALERS/DISTRIBUTORS WE NEED YOU
Please telephone for dealer pack and full information.

Note we only sell high quality ST software that is supplied on single sided diskettes and is compatible with all 520/1040 ST computers. Mega ST compatibility please telephone.

CIRCLE 063 ON READER SERVICE CARD

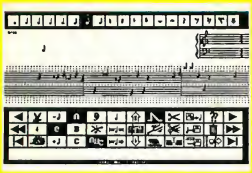
Music from MichTron...

ST-Replay

ST-Replay is an exciting new program that allows you to digitize and replay various sounds, including musical instruments, television programs, even your own voice. These sounds can be played back through your monitor, T.V., or a stereo system. *ST-Replay* also includes ST-ECHO, a program to allow special sound effects.

$199.95

Musix 32



Musix 32 is the new music program that allows you to pick notes and rests from a menu, then drag them with the mouse to an onscreen staff. Once you have created your composition, you can immediately play it back. Music writing and editing has never been simpler! You can compose for one to three voices, and all compositions can be saved to disk, or printed on a dot matrix printer.

$59.95

DigiDrum

Turn your Atari ST into a sizzling, digitized drum machine with *DigiDrum*. From the cool syncopated beat of a Jazz improvisation to the martial flare of a staccato snare, you can experience it all, digitally , with this amazing program. It allows you to store up to 99 patterns which can have from 4 to 32 beats per patterns. Also, *DigiDrum* is compatible with the sound digitizer, ST-Replay.

$39.95

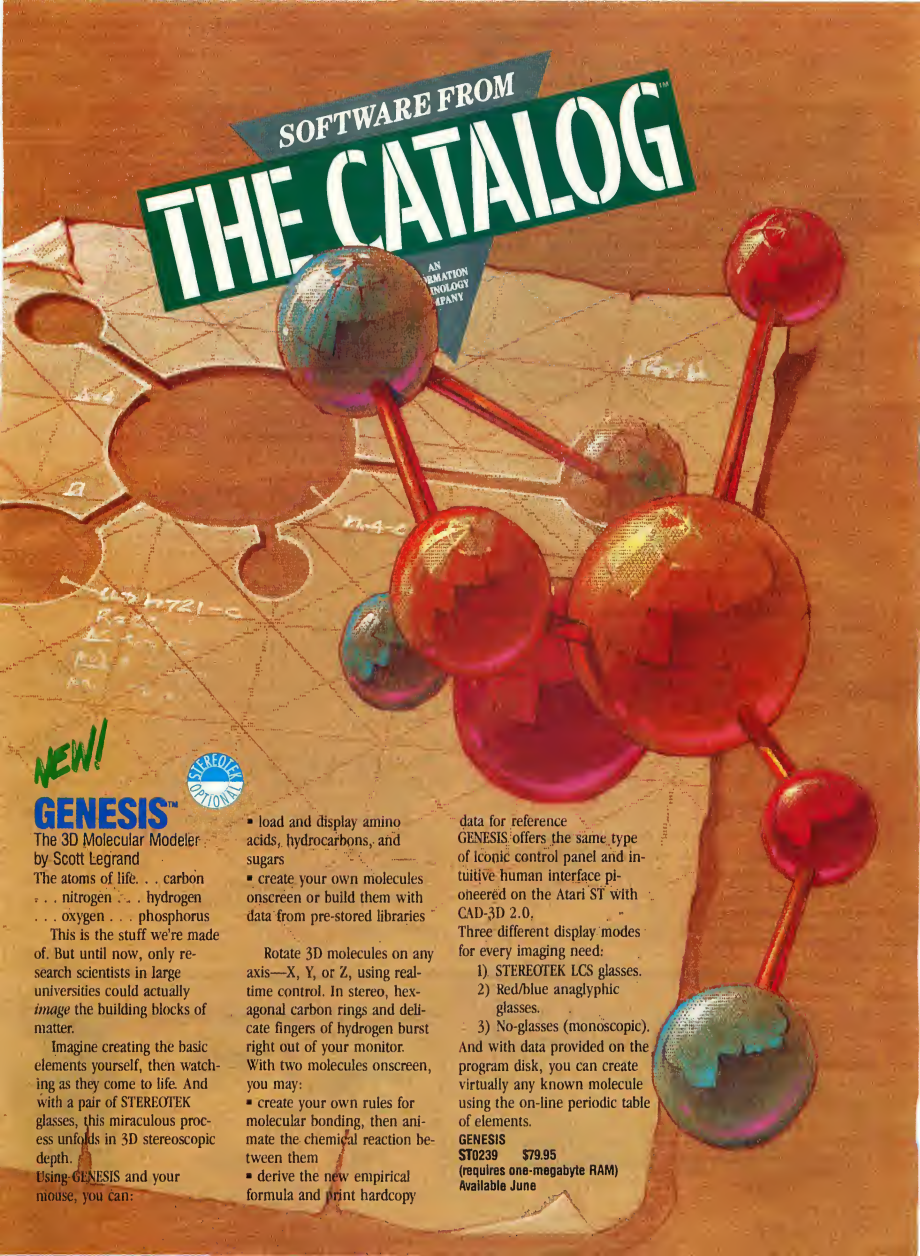
Super Conductor

Presenting *Super Conductor*, the professional 16 track MIDI sequencing package that no musician should be without. Loaded with powerful features, *Super Conductor* can quantize (auto correct), filter, transpose, edit, and mix music played through a synthesizer. Comprehensive editing gives musicians precise control over their performances, including the alteration of controllers such as volume pedal, pitch bend, and modulation settings.

$79.95

For more information on these exciting new music programs, contact:

MichTron
576 S. Telegraph, Pontiac, MI 48053
Orders and Information (313) 334-5700



NEW!

STEREOTEK OPTIONAL

GENESIS™

The 3D Molecular Modeler
by Scott Legrand

The atoms of life. . . carbon . . . nitrogen . . . hydrogen . . . oxygen . . . phosphorus

This is the stuff we're made of. But until now, only research scientists in large universities could actually *image* the building blocks of matter.

Imagine creating the basic elements yourself, then watching as they come to life. And with a pair of STEREOTEK glasses, this miraculous process unfolds in 3D stereoscopic depth.

Using GENESIS and your mouse, you can:

- load and display amino acids, hydrocarbons, and sugars
- create your own molecules onscreen or build them with data from pre-stored libraries

Rotate 3D molecules on any axis—X, Y, or Z, using real-time control. In stereo, hexagonal carbon rings and delicate fingers of hydrogen burst right out of your monitor. With two molecules onscreen, you may:

- create your own rules for molecular bonding, then animate the chemical reaction between them
- derive the new empirical formula and print hardcopy data for reference

GENESIS offers the same type of iconic control panel and intuitive human interface pioneered on the Atari ST with CAD-3D 2.0.

Three different display modes for every imaging need:

1) STEREOTEK LCS glasses.
2) Red/blue anaglyphic glasses.
3) No-glasses (monoscopic).

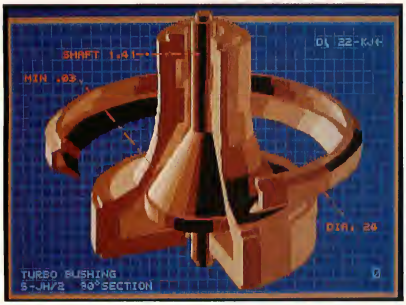
And with data provided on the program disk, you can create virtually any known molecule using the on-line periodic table of elements.

GENESIS
ST0239 $79.95
(requires one-megabyte RAM)
Available June

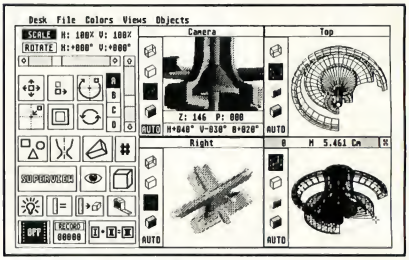
THE CYBER STUDIO™ (2-program set)

STEREOTEK OPTIONAL

The first affordable integrated 3D video production workstation.



"Antic's CAD-3D is one of the best programs I've seen for the Atari or anything else."
—Jerry Pournelle
Byte Magazine



Tom Hudson's STEREO CAD-3D 2.0™

Supports (optional) STEREOTEK 3D Glasses

Hidden within your Atari ST is a professional 3D workstation. A 3D design system that is intuitive—yet powerful enough for professional artists, advertising agencies, or design firms.

We've taken every suggestion from graphics professionals who loved version 1.0, but wanted more designing power and speed. And then we made version 2.0 an open-architecture system, so that any programmer can easily write custom applications for CAD-3D 2.0 that run as desk accessories: motion control choreography, advanced rendering/ray tracing, finite element analysis, texture mapping, custom modeling tools. . . There's no limit. CAD-3D 2.0 will never become obsolete.

Let your creativity soar with all these new features:

- Icon control panel—fast, intuitive interface
- All new, DEGAS-style color design system permits custom-color lines, edges and backgrounds, multi-colored objects
- Real-time display mode for instant response (uses 3D math developed by Jez San for Starglider™)
- Supports (optional) STEREOTEK 3D glasses for 3D viewing
- Dimensioning (feet/inches or meters/centimeters)
- Graphic lighting control—drag lights anywhere
- GDOS output supports laser and dot matrix printers
- Load/Save 2D object templates (from other CADD systems)
- Customized rendering system plus Z-buffer accuracy
- User-selectable pivot points for articulated rotations
- Enhanced Spin, Extrude, and Join tools
- Load DEGAS pics into CAD-3D background

Mark Kimball's CYBERMATE™

Supports (optional) STEREOTEK 3D Glasses

The CAD-3D Animation/Editing language

You need powerful tools to produce a professional 3D digital animation. Important things like editing, special effects, and sound are critical elements in a high-quality presentation. CYBERMATE is a full-featured animation language that gives you control over:

- Sequence looping, cuts, fades, wipes & dissolves
- Color shifting
- Sound effects (created with the G.I.S.T.™ editor, on pg. 11)
- Acceleration & deceleration
- Title generation and text display

CYBERMATE features editing power comparible to a Hollywood post-production studio, plus full programmability. At your fingertips is the most efficient real-time playback system for 3D graphics ever on a microcomputer. And it's fast!

How does it work? At the heart of CYBERMATE lies our exclusive delta compression format, which transforms your one-meg ST into a TEN-MEGABYTE frame buffer. Up to a thousand frames of animation can be held in RAM at once. And because it's a real programming language, CYBERMATE can adapt to new technologies, like the new digital video tape recorders from Japan, RGB-to-NTSC converters, MIDI, and SMPTE time code.

THE CYBER STUDIO
STEREO CAD-3D 2.0 plus CYBERMATE
2-disk set (requires one-megabyte RAM)
Upgrade from CAD-3D 1.0 for only $60 (plus original disk and $5 shipping)

Starglider™ Firebird Software
DEGAS™ Batteries Included

ST0236 $89.95

"A remarkably powerful modeling system."
—Computer Graphics World

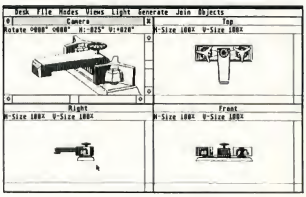
The Original...

Tom Hudson's CAD-3D™ 1.0

520ST-compatible

If you own a 520ST and are interested in computer graphics, many of the features of CAD-3D 2.0 are included in this original version—you even get a basic animation system.

(requires 512K RAM)
ST0214 $49.95



CYBERSCAPE©

A 3-D "feature film" on disk
by Darrel Anderson

Skim the fantastic, 3-dimensional terrain of the mind! Metamorphosing metallatons and transforming tubular time slots! This full-color, animated feature was created by **professional artist** Darrel Anderson, to show what can be done with CYBERMATE—The CAD-3D Animator. An incredible to**ur de force** of computer graphic power, this demo is a guaranteed auto-lobotomy of the very first order!

CYBERSCAPE DS
(1 double-sided disk)
SB0104 $10.00

CYBERSCAPE SS
(2 single-sided disks)
SB0105 $12.00
(Both versions require 1 megabyte RAM)

Now you can write the next hit 3D program!

3D DEVELOPERS DISK

For CAD-3D 2.0
by Tom Hudson

NEW!

While Tom was rewriting CAD-3D, he quickly realized that it was impossible to add *everything* and still release a product in this century. Plus, who wanted CAD software that required a 4 megabyte machine? So he opened up the system—by providing a programmers 'pipeline' through desk accessories.

Opportunity Knocks!

The 3D DEVELOPERS DISK clearly explains to programmers and developers how to access the pipeline. Included on the disk are full-featured example source and object code examples, plus detailed instructions by Tom Hudson showing you how to hook into CAD-3D 2.0. Create your own 3D applications—with no knowledge of 3D math. There's no licensing fee required.

(Requires CAD-3D 2.0)
(works with most popular ST C's plus machine language)
3D DEVELOPERS DISK
ST0244 $29.95
AVAILABLE JUNE

3D-FONT PACKAGE

by Tom Hudson

Design your own 3D greeting cards, signs, logos, and letterheads with CAD-3D. Or create sophisticated 3D animated title sequences for your home videos.

At the heart of this **packed** disk is Tom Hudson's new SUPER EXTRUDER TOOL. With it, you can create new kinds of complex, **multicolored 3D objects** that can't be built with CAD-3D alone. Plus, it doubles as a 3D FONT EDITOR, and Tom has built **two incredible fonts** just for you (serif and sans-serif, upper and lower case—over 250K of fonts!).

(requires CAD-3D)
3D-FONT PACKAGE
ST0224 $24.95

PLOTTER AND PRINTER DRIVERS

Plot your 3D drawings on a high-resolution pen plotter for a truly professional look! Supports Hewlett-Packard (and HP compatible) plotters. Multi-plots on a single page—best fit system.

(requires CAD-3D)
PLOTTER DRIVERS
ST0225 $24.95

Also, dot matrix printers supported: GEMINI/STAR, EPSON, OKIDATA, IBM, COLOR (Radio Shack, Epson, Canon), NEC, PANASONIC, C-ITOH, and more.

THE CAD-3D DESIGN DISK LIBRARY

Darrel Anderson and Richard Berry
YOUR FOUNDATION FOR THE BEST IN CAD-3D ART

HUMAN DESIGN DISK™

NEW!

Populate the CAD-3D Universe. Bring life to your CAD-3D creations with the CAD-3D HUMAN DESIGN DISK. Complete modular male and female prototypes, in skeletal and surface anatomy forms, are included. A variety of complex heads and hands add detail and realism to your figures. Modify your figures to create the infinite variety of the human form, pose your figures, detail the images with any popular paint program, or bring them to life with the CYBERMATE Animation System. Includes:

- Blueprints
- Tips on the dynamics of human anatomy.

ARCHITECTURAL DESIGN DISK™

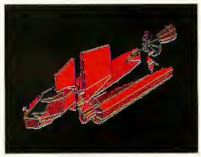
NEW!

Create CAD-3D renderings of your Dream House or build an entire CAD-City from the ground up. Component parts including: Doors, Windows, Arches, Roofs, Walls, Stairways, and a wide variety of architectural accoutrements. Create your own CAD structures and populate them with HUMAN DESIGN figures. Build "sets" for your CYBERMATE animated movies.

NOTE: The ARCHITECTURAL DESIGN DISK can be used to visualize and render real world architecture. It is not intended for use as an architectural engineering tool. Includes:

- Blueprints
- Complete Models
- Design Tips

FUTURE DESIGN DISK™



Get a fast start on your three-dimensional explorations with the CAD-3D FUTURE DESIGN DISK. Everything you need to create SPACECRAFT, STATIONS, BASES, VEHICLES, ROBOTS, and ANDROIDS. Model your future then populate it with androids and CAD-People. Bring it to life with CYBERMATE; detail it with any popular paint program. Includes:

- Blueprints
- Complete models
- Component parts
- Construction tips

***HUMAN DESIGN DISK**
ST0242 $29.95
***ARCHITECTURAL DESIGN DISK**
ST0243 $29.95
FUTURE DESIGN DISK
ST0232 $24.95
(All Design disks require CAD-3D)
***AVAILABLE JUNE**

True stereoscopic 3D graphics for your Atari ST.

STEREOTEK™ 3D GLASSES

by LC Technologies

Put on the STEREOTEK glasses and jump into a new universe. Discover a magical world that you always knew existed. That *extra* dimension—DEPTH. Now you can add depth to your computer graphics with the STEREOTEK Liquid Crystal glasses. Solid, realistic, 3D images you want to reach out and touch. STEREOTEK glasses plug into your ATARI ST cartridge port to provide absolutely realistic 3D graphics in full color or hi-res monochrome.

Your STEREOTEK depth-view system includes:

- One pair electronic Liquid Crystal Shutter glasses with four-foot cable (can be comfortably worn over eyeglasses).
- ST cartridge interface unit—supports two sets of glasses (second set optional).
- DEGAS Elite Stereo Desk Accessory.
- Stereo CAD-3D animation and stereo slide show by Tom Hudson.
- For programmers: Complete developer's instructions plus sourcecode for adding stereo to your own programs. (C or GFA BASIC)

The secret to full-color stereo images on a computer screen is electronic Liquid Crystal Shutter (LCS) glasses. Two optical shutters in eyeglass frames are connected electronically to the ST. Every time the ST screen refreshes (60hz/color, 70hz/mono), one shutter closes and the other opens. The monitor displays alternating right and left eye views synchronized with the shutters. The alternating views appear faster than the eye can see, and your brain translates the normally flat monitor image into one of startlingly realistic depth.

STEREOTEK 3D SYSTEM
TH9020 $149.95
ADD-ON GLASSES ONLY
TH9021 $99.95
STEREOTEK 3D SYSTEM
Manufacturer's Sugg. List: $189.95
Catalog Price: You pay only $149.95

LC Technologies is a venture of Tektronix, Inc.

NOW! AVAILABLE FOR USE WITH STEREOTEK GLASSES

NEW!

LCS WANDERER™

by Pyramide Software

Deep space has never been so real!

LCS WANDERER is the first ST game designed for full-depth stereo. Written in France, but set in outer space, this stunning arcade adventure transports you through galactic Space sectors, Black holes, and Limbo. Startlingly realistic, stereo point-of-view animation puts you in the cockpit as you swoop and dive through star fields while dodging enemy craft.

This is no ordinary space shoot-em-up. The bizarre, complex plot involves the ruthless kidnapping of every cat on earth. As you wander through space, collecting purloined pussycats, you run across the Heads of State of the Planetary sectors with whom you must play interstellar poker. LCS WANDERER is a complex, multimodular program—really several games in one. Journey from the dogfights in the Space sectors to the interstellar poker strategies, from the Battlezone-style of the Planetary sectors to the stereo tunnel of the Black holes, and Limbo . . . well, there's always Limbo.

The liquid-crystal clarity of the StereoTek glasses transforms LCS WANDERER into a multi-colored micro universe within your monitor. Includes a completely redesigned solid-surface cockpit, full 16-color displays, and reduced eye-fatigue compared to the original red/blue version.

(Requires color monitor and StereoTek glasses)
LCS WANDERER
ST0238 $39.95

Battlezone™ Atari Corp.

$5,000 CONTEST

Antic and LC Technologies are co-sponsoring a competition to search for the MOST INNOVATIVE STEREO APPLICATION PROGRAM. We're going to pay $5,000 in cash (advance against royalties) for the winner, plus a continuing royalty upon publication here in The Catalog.

For an official entry blank and competition details, write to: STEREO COMPETITION; The Catalog, 544 Second St., San Francisco, CA 94107, or call (415) 957-0886.

NOW! A PROFESSIONAL FLIGHT PLANNER FOR THE ST!

THE NAVIGATOR™

by Scott D. Stephenson

• Works with MAPS AND LEGENDS

NEW!

Sometimes, you really need to know *exactly* where you're going. Have you ever wondered, while boarding your plane, how the pilot will find his way to your destination? The answer is navigation. The pilot follows a detailed flight plan created by his navigator.

Now, accurate computerized navigational planning is available on the Atari ST. THE NAVIGATOR is a professional, automated flight planner created specifically for the ST by professional navigator Scott D. Stephenson. Private pilots, military pilots, navigators (ocean-going as well as air), and commercial operators can use this amazing program to create accurate, detailed flight plans.

Amateurs, arm-chair flyers, teachers and students of navigational theory can discover how the professional navigator plans his flight, compensates for wind direction, establishes waypoints, and calculates times and distances. And we've included a special MAPS AND LEGENDS overlay function which creates custom map overlays, graphically displaying your flight paths.

- PRIVATE PILOTS: You'll love THE NAVIGATOR'S printed flight plan and extensive ICAO waypoint database.
- ARMCHAIR PILOTS: Generate your own flight plans for subLogic's FLIGHT SIMULATOR II.
- TEACHERS: Show your students the rudiments of navigation. Use THE NAVIGATOR plus MAPS AND LEGENDS to measure the earth!
- SAILERS: Plan for currents or winds—taking fuel flows and times into consideration.
- THE NAVIGATOR comes complete with these databases: European ICAO, Asian ICAO, and US ICAO.

TWO PROGRAMS IN ONE!

Included with THE NAVIGATOR is THE NAVIGATION TOOLKIT a bonus program of computer navigation tools which performs sophisticated data management operations on your waypoint databases. Create new data files or modify existing files using its advanced random-search technique.

THE NAVIGATOR
ST0245 $49.95

THE WORLD ON A DISK.
MAPS FOR EVERYBODY!

MAPS AND LEGENDS™— The Cartographer

STEREOTEK OPTIONAL

Enhanced Version
Supports (optional) StereoTek Glasses
by Harry Koons and David Chenette

Hold on a second. Now that you've word-processed, spreadsheeted, databased and telecommunicated with your Atari ST, aren't you looking for **something different?**

How about Cartography? Until now, mapmaking has been a unique art mastered by only a few talented people. Not anymore. With MAPS AND LEGENDS, your Atari ST becomes a personal desktop cartography system.

Show your children exactly what the world looks like—with or without political boundaries. And in STEREO, the world globes appear

to be floating **in front** of your monitor. Or print an impressive custom map to go with your travel itinerary. We use MAPS AND LEGENDS all the time at the office for sales and marketing maps. And since it's based on the GEM interface, it's GEM-easy to use!

MAPS AND LEGENDS 3.0
ST0202 $34.95
(upgrade is $15)

800-443-0100, ext. 133

24 hours-a-day

(Continental U.S. and Hawaii) Visa/MC Only

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LET'S-GET-TECHNICAL BOX

Packed with features, including: STEREO COMPATIBILITY, BUILT-IN 9000-COORDINATE DATABASE, 11 DIFFERENT MAP PERSPECTIVES, PLOTTING FROM ANY ALTITUDE, WORKS IN ALL 3 SCREEN MODES, BUILT-IN PAINT SYSTEM (and compatible with DEGAS and NEO), MULTI-FONT LABELLER, CUSTOM OVERLAY PLOTTER (create your own maps—build your own map databases), AUTO-LOCATE MODE (reads coordinates, distance and bearing from maps) and so many more that we don't have room to list them all.

DATAMAP COLLECTION I

Expand Your Maps and Legends Database!

NATIONAL POLITICAL BOUNDARIES
Europe, Latin America, S. America, Asia, Africa

PROVINCIAL BOUNDARIES
Australia, Canada, China, U.S.S.R.

(requires Maps and Legends 2.0 or greater)
DATAMAPS
ST0227 $24.95

PLUS HISTORICAL MAPS AND MORE!

BASETWO™

The GEM Database by the Authors of DBMASTER ONE

THE NEXT STEP IN DATABASES, BY THE AUTHORS OF DB MASTER ONE™!

BASE-TWO™

Dan Matejka
and Stanley Crane

It's no fun re-learning your database commands every time you boot it up. And those simplistic "filecard" databases just don't have the power to do the job. Or, maybe you've just created your custom database, entered 5,000 records, and now you want to print a report. . . Good luck. You need a degree in programming just to get some decently formatted hardcopy!

Dan Matejka and Stanley Crane have eight combined years of experience writing databases on computers ranging from the IBM PC to the Apple Macintosh. And their databases range in complexity from the extremely powerful and complex IBM PC DB MASTER to the familiar, introductory DB MASTER ONE on the Atari ST. They've watched the ST database market grow—and they've spotted a gap: Until now, ST databases have been either too simple, or too complex. Until now, ST owners were limited to easy-to-use, inflexible "mailing lists," or involved, programmable "throw-backs" to the CP/M or MS-DOS world. Until now, there was no intuitive, yet powerful database featuring an adaptable report generator. *Until now.*

BASE-TWO fills the gap. Entirely GEM-operated, DB MASTER-ONE owners will find it familiar, yet far more powerful. Look over some of the features and see if it solves your problem:

- Variable field types:
  - Implicit (default)
  - Alpha
  - Numeric
  - Date (calculable)
  - Formula
- Formula fields automatically calculate results from several fields in same record
- Adjustable numeric decimal placement
- Re-edit database at any time without loosing data
- User-definable .DIF file creation for software compatibility (with A-CHART, for example)
- DB MASTER-ONE conversion program
- On-line Help screens
- Optional mouse or keyboard control
- 64 character label length
- 100 fields per record
- Multi-level Search and Sort
- Totally RAM-based for instant action
- Format disks from within program

The intuitive BASE-TWO **Report generator** includes:

- Multi-line field word-wrap; screen and printer
- Completely adustable label or column-format report
- Place "comment" text anywhere
- Customize with printer control codes
- 'Soft" field borders for auto-field truncation

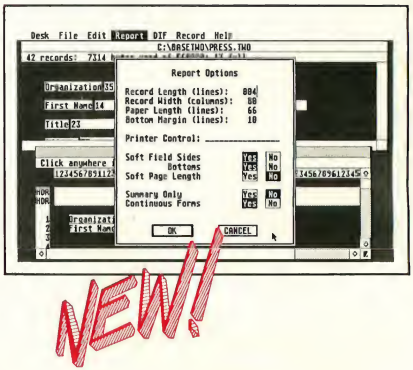
INSTANTANEOUS SORTING!

size	# records	sort time
512K	5,000	5.1 sec
1 Meg	10,000	9.7 sec
2 Meg	20,000	19.2 sec
4 Meg	50,000	46.1 sec

Using a sample eight-field mailing list.

- Optional, automatic date, time, and page numbering
- Print reports to screen, printer, or ASCII disk file for word-processor editing
- Optional subtotal printout
- Adjust number of records per page
- Double-line report headers
- Single-sheet or continuous feed option
- Store 10 custom reports for each file
- Up to 100 unique fields per report

BASE-TWO
ST0246 $59.95



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PHA$AR IS THE STANDARD BY WHICH OTHER FINANCIAL PACKAGES WILL BE MEASURED

IBM AND AMIGA USERS SAY:

"The first home accounting package I have found in five years that is actually usable."
—Mark Baldwin, Littleton, CO

"I am enjoying your tutorial almost as much as I admire the power and versatility of the software itself."
—Joe Joyce, Huntington, VT

PHA$AR

Professional Home Accounting System and Register
by Marksman Technology

WHAT PHA$AR IS: A friendly, GEM-based, single-entry accounting system that will make your life easier. PHA$AR is fast, sophisticated and contains the best interface programming design we've seen in any ST applications program.

GENERAL FEATURES
- 130 expense/income categories
- 40 accounts (VISA, checking, etc.)
- Up to 500 transactions per month
- Custom check printing
- A.I. parser predicts input, minimizes typing
- Instant help messages with right mouse button
- Relational design integrates financial data

TRANSACTIONS
- Automatic transfers between accounts
- Split-category transactions
- Create transaction macros for repetitive entries
- Point-and-type spreadsheet-style relational summary update

FINANCIAL ANALYSIS
- Easy budget setup and maintenance
- Analyze loan/savings plans
- Display multiple loans simultaneously for easy comparison

DATE/ADDRESS ORGANIZER
- Store up to 250 names, addresses and phone numbers
- Integrated scheduler stores special occasions
- Display calendar with highlighted special occasions
- Optional auto-alert reminds you of important events

RECONCILIATION
- Display outstanding transactions for any account
- Confirm transactions with single keystroke

REPORTS
- Clearly formatted printed reports include:
  - Account Summaries
  - Category Summaries
  - Net Worth Statement
  - Tax Calculations
  - And more . . .
- Display or print total income/expenses, monthly or year-to-date
- Sort categories in any order
- Built in data graphing
- Compatible with A-CHART

TAX
- Design your own tax forms—never out of date
- Calculate tax liability in less than one minute
- Project tax liability at any time

PHA$AR
ST0237 $89.95

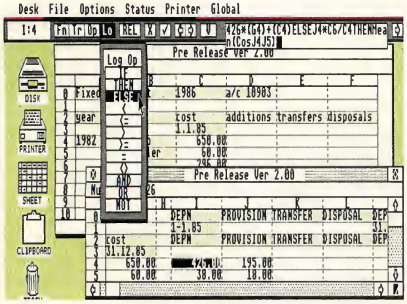
BYTE TESTS SHOW A-CALC ALMOST **TWICE** *AS FAST AS MICROSOFT MULTIPLAN ON THE MAC PLUS!*

A-CALC PRIME™ by Kuma

Kuma Computers, Ltd. UK

That's right! In the February 1987 review of the Atari 1040ST, BYTE magazine selected A-CALC 1.0 to test the Atari against the Amiga and the Macintosh Plus. On recalculation of a 25×25 cell spreadsheet, A-CALC was the clear winner at 4.7 seconds, compared to 7.5 on the Mac Plus, and 6.5 on the Amiga (using Lattice Unicalc).

And now, you can have all the speed of the original GEM-based spreadsheet plus the powerhouse features of the next generation: A-CALC PRIME—it blows away the competition.



Features that made the original A-CALC 1.0 the easiest-to-use spreadsheet ever:

- Up to five windows open at once
- WIDE-VIEW option to see 50 percent more of your worksheet at once
- SEARCH for character strings
- Powerful PRINTER FORMATTING commands

"This is the easiest to use spreadsheet that I've ever seen."
—W. Krieger
Computer Shopper Magazine

- .DIF file compatibility
- Exclusive A-CHART compatibility
- Sparse-matrix design maximizes available RAM

And now, PRIME adds dozens of special features:

- Row and column lock.
- Conditional expressions (IF, THEN, ELSE, etc.)
- MACROS
- Labels
- 8192 rows×256 columns
- Color/pattern coding of formula, text, value, etc.
- SORT and FIND
- Trig functions
- **Sideways** printing (for Epson compatibles)
- High-speed SMOOTH screen updating
- Complete printer control from **within** the spreadsheet
- Password-protected cells (hide and unhide)
- Additional ease-of-use features:
  - **Off-screen** scrolling with the mouse
  - **Out-of-the-way** convenient edit window
  - Cell and range reference by **pointing with the mouse** (even reference cells in inactive windows!)
  - **Ten** clipboards
- Illustrated manual and on-disk examples

In short, PRIME gives you premium spreadsheet power for the rock-bottom price of $59.95. And, for A-CALC 1.0 owners, the upgrade is only $20.00 (plus $5.00 shipping. Enclose your original ver. 1 disk).

A-CALC PRIME
ST0235 $59.95

Make your next presentation the one they **remember.**

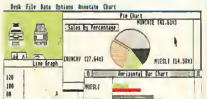
A-CHART™ by Kuma

Kuma Computers, Ltd. UK

When was the last time you were excited about your spreadsheet? A-CHART makes working with figures **fun and intuitive**.

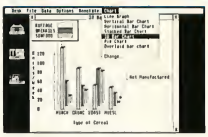
A-CHART automatically turns your A-CALC (or A-CALC PRIME) spreadsheets into beautiful graphs that are DEGAS-compatible. And, if you don't have a spreadsheet, A-CHART's **built-in editor** will help you organize those numbers into a super-sharp presentation.

View your data in **eight different chart styles**—change styles instantly with one mouse click. **Drag and size multiple**

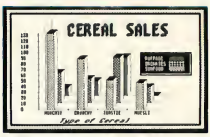


A-CHART

DEGAS ENHANCED



A-CHART



DEGAS ENHANCED

charts in each window, **define your own fill patterns and line styles**. The flexibility of the graphic presentation of your numbers will give you **an entirely new perspective on your business or home budget**. And A-CHART grows as you do, with the capability of storing up to 50,000 data points in a 512K machine and 150,000 datapoint in a 1 meg machine. **Full statistics menu** for detailed analysis includes Mean, Median, Variance, Standard Deviation, Skewness, T-test, F-test, and much more.

A-CHART
ST0230 $39.95
Epson-compatible from A-CHART.
Multi-printer compatible from DEGAS.
File compatible with BASE-TWO, PHASAR, and A-CALC PRIME

"FLASH is my #1 choice on the Atari ST."

—Ron Luks, Founder of CompuServe's SIG*Atari and Atari Developers Forum.

THE MOST POPULAR TERMINAL PROGRAM FOR THE ATARI ST.

FLASH™

Version 1.1
by Joe Chiazzese and Alan Page

If you own a modem, you should be using FLASH. Why? Because FLASH is the best. It will simplify your online time and make telecommunicating more enjoyable and less expensive.

TOTALLY PROGRAMMABLE PLUS BUILT-IN WORD PROCESSING

Imagine turning on your ST and, with **one click** from the GEM Desktop, beginning an online session on your favorite BBS. Watch FLASH dial the number, log on, and **automatically** browse through the most recent messages or files. Then, edit some email in the **built-in message editor,** and upload it right from the capture buffer. Instantly! It's your personal telecom droid. So programmable that you have **total control,** and so GEM-intuitive that you feel right at home the first day you use it. No wonder FLASH is the most popular Atari terminal program of all time.

TERMINAL EMULATION PLUS BULLETPROOF FILE TRANSFERS

Of course, FLASH has a barrel full of terminal-emulation features, such as DEC VT100/VT52 and CompuServe Vidtex graphics, so you can use it with **every** mini or mainframe editor. And talk about bulletproof file transfers! It's got the most **reliable** Xmodem around—never lose a file during transmission again!

PACKED WITH FEATURES!

Here are just a few of the most useful features. Shop around and see if any other terminal program can even come close!

- Built-in GEM word processor with cut & paste
- Programmable "script" language (70 commands)
- Mainframe terminal emulation
- Xmodem (CRC), ASCII and DC2/DC4 file transfers
- Totally configurable to **your** needs!
- $15 online time and CIS membership

Ask your local telecom guru's opinion. FLASH is the winner... **hands down!**

FLASH
ST0220 **$39.95**

FLASH COMMAND CARDS **FLASH-CARDS** **TH9025** **$7.95**

"FLASH is to the Atari ST what Lotus 1-2-3 is to the IBM PC."
—Ken Wolburn ***Microtimes Magazine***

*DOUBLE THE POWER OF YOUR **FLASH!** TRANSFORM IT INTO A BBS! ADD KERMIT!*

REMOTE CONTROL ACCESSORY & KERMIT PROTOCOL™

by Joe Chiazzese and Alan Page

One mouse-click tranforms FLASH into a password-protected BBS. You can send and receive files while you're in another room or even away from home!

Plus, you can now use the powerful KERMIT protocol with FLASH. **With KERMIT, you can transfer up to 128 different files without touching your keyboard!** More powerful than the version shipped with the Atari Developer's Kit—total automation for less than $25!

Works with any Hayes-compatible modem.

(Remote/Kermit requires FLASH™)
ST0226 **$24.95**

SOUP UP YOUR MODEM. . . IN SOFTWARE!

NEW!

QUICKTRAN™

The Modem Accelerator
Adrian Jovanovich

Your 1200-baud modem can now transfer files at over 2000 baud. . . 2400 baud now flies at 4000 baud. . . The telephone company can't stop you. It's totally legal!

The Buddy System

QUICKTRAN comes to you as two identical disks. Each contains a desk accessory that works by itself (as a VT52 emulator), or with FLASH. The QUICKTRAN accessory automatically shrinks a file when you're sending it—in real time, smaller than ARC.TTP. And on the receiving end, the file is expanded back into it's original size as it's coming in over the phone lines.

Why spend hundreds of dollars on a faster modem when you can transfer files in almost half the time with QUICKTRAN? Get together with a friend and start a modem conspiracy!

QUICKTRAN
ST0247 **$34.95**
(2-disk set)

FREE! Try FLASH now and get $15.00 of CompuServe access time, FREE.

Order now and you'll receive a CompuServe Intro-Pak; your free introductory subscription to the CompuServe Information Service with a 46-page CompuServe mini-manual. Plus $15.00 worth of CompuServe access time, free.

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ARTIFICIAL INTELLIGENCE
Teach your ST, then let it teach you!

EXPERT OPINION™

by Mind Soft

Curious about expert systems and artificial intelligence? Discouraged because most expert systems tools are either for the IBM PC or Macintosh? And usually cost over $700?

Transform your ST into an expert on any subject. EXPERT OPINION creates production-rule knowledge bases with more power than the average university system. And you don't need to know a programming language like Prolog or LISP—EXPERT OPINION is totally GEM-based...so you already know how it works.

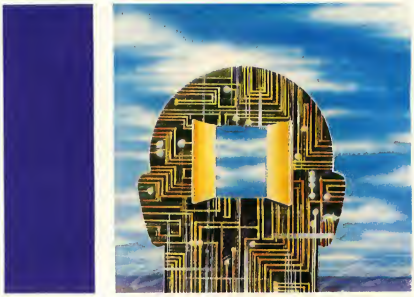
Create your own expert systems for classification of Horticulture, Animal Husbandry, Gemology, Medical diagnosis, Economics—any subject you want. Be a part of the first wave of knowledge engineers!

EXPERT OPINION's "Inference Engine" solves problems three ways: **DEDUCTION** (forward chaining); **VERIFICATION OF A HYPOTHESIS** (backward chaining); or a unique combination of both modes. **CERTAINTY LEVELS** allow you to fine-tune your knowledge base with heuristic control. Plus, the clear, well-written documentation includes a tutorial by Harvard expert and START contributing editor Christopher Chabris.

FREE BONUS! To get you started, we've included a disk packed with knowledge bases about a typical application ...Gemology. The six linked knowledge bases will guide you through the classification of over eighty kinds of rocks and minerals. Perfect for studying how an expert system is built.

EXPERT OPINION
(2-disk set)
ST0219 $99.95

WARNING: This is a sophisticated computer science tool requiring study to use it effectively.



BATTERIES INCLUDED

ANYTHING THIS MUCH FUN IS USUALLY ILLEGAL.

D.E.G.A.S. ELITE™

by Tom Hudson

The best-selling graphics software on the Atari ST just got **ten times better!** D.E.G.A.S. ELITE has all the power of the original, **plus:**

1) Multi-color fill patterns
2) Special effects like scaling, perspective distort, rotating, outlining, and color animation
3) Multiple screens in RAM at once (up to 8)—cut and paste between them
4) Color search and replace

DEGAS ELITE
TH9036 $79.95

INTEGRATED FINANCIAL SOFTWARE FROM BATTERIES INCLUDED

THE ISGUR PORTFOLIO™

THE ISGUR PORTFOLIO is three programs in one: Portfolio manager, telecommunications, and calendar/memo pad. Receive Dow Jones stock quotes, CompuServe, The Source, and InfoGlobe financial information, automatically. Consolidate multiple stock portfolios. Hands on management of stocks, bonds, options, commodities, mutual funds—your key to financial success.

A real value for your investment. Plus, **THE ISGUR PORTFOLIO** includes **I•S TALK.** Invest in your future...today.

TH9009 $199.95

A SPELLING CHECKER THAT IS LIGHTNING FAST!

THUNDER™

THUNDER gives you a powerful spelling checker accessible from within your favorite application program. Your accuracy will skyrocket, so the time spent proofing will plummet.

It's so simple. Here's how it works. Example: you're happily writing away and you make a "mstake" and BEEP (**THUNDER** picks up the error with lightning-fast speed). Now **THUNDER** will display a list of similarly spelled words (stake, mistake, etc.).

TH9011 $39.95

TAKE A SECOND FOR TIME MANAGEMENT

TIMELINK™

TIMELINK is a great GEM-based scheduling and time-keeping tool for home and business. Your day, week, month and year appointments are only a mouse-click away. Useful for messages, reminders and much more. There are many incredible uses for this handy elegant, time-saving tool.

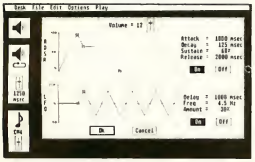
TH9010 $49.95

CREATE NEAR-SYNTHESIZER-QUALITY SOUND EFFECTS WITH OUR ***SOUND LABORATORY.***

G.I. Sound Tool G.I.S.T.™

by Lee Actor & Gary Levenberg for Synthetic Software

If **sound** has always fascinated you . . . or if you're a programmer or developer. . . take a look at G.I.S.T., the sound editor. G.I.S.T. was created to establish a standard of sound generation on the Atari ST that far surpasses the abilities of the built-in sound chip.



G.I.S.T. is really two programs:
1) GEM-based editor
2) Sound Driver

As you can see from the screen display, the G.I.S.T. editor gives you real-time mouse control over any sound shape. The key to G.I.S.T.'s power is dynamic control of the GI chip. Each voice has three ADSR (envelope) controls and three LFO's (low frequency oscillators). You'll be creating sounds like a professional engineer—Near Synthesizer Quality (NSQ) sound.

For programmers, the Sound Driver is linkable object code that can be used in your own software. Adding superior sound effects to **any** program. . . It's interrupt-driven, so it won't impact the speed of your software. In fact, it's already built into CYBERMATE for CAD-3D—just one of many useful applications.

LET'S-GET-TECHNICAL BOX

- Volume ADSR to shape attack, decay, sustain, release
- Volume LFO for Tremolo effects and AM (Amplitude Modulation)
- Frequency ADSR—frequency shifts up to ± 3 octaves!
- Frequency LFO for Vibrato effects and FM (Frequency Modulation)
- LFO delay lets you add effects at any point in the sound
- MIDI-compatible! Use your keyboard to play the GI chip
- Three sound windows may be open at once

G.I.S.T. is also compatible with CYBERMATE. **Add sound effects to your CAD-3D animations!**

Source-compatible with Alcyon C, Megamax C, and Lattice C.
G.I.S.T.
ST0233 $34.95

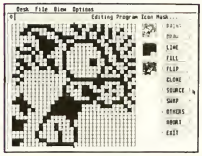
START ICON EDITOR HITS

P.I.E.™ NEW!

Professional Icon Editor
Alex Leavens

It began as a hot little desk accessory in START, The ST Quarterly—you know, "Customize Your Desktop Icons!" or so the copy read. And it was a lot of fun. You could redesign your Trash can to look like a paper shredder. But the programmer, Alex Leavens, just couldn't leave it alone. He kept *adding* things. . .

Now, the Desktop Icon Editor has graduated. P.I.E. is the *Professional* Icon Editor—for programmers as well as desktop artists. Alex has added



icon code generation so you can now design icons for your own programs. And while he was at it, he added a bunch of graphics improvements to delight the artist in you.

New features include:

- Generates Resource Construction Set code for icon images; P.I.E. can be used from within the Resource Construction Set to create and edit icons for the resources you're currently working on!
- Improved Editing Features:
- Faster Paint and Line modes
- New Image Cut & Paste functions
- Selectable Fill Patterns
- Horizontal and Vertical Image Flip
- Multiple Sub-function Menus added
- Nine-level Bi-directional Undo buffer
- In-program Desktop Icon Preview mode
- Improved Keyboard Response

P.I.E.
ST0248 $29.95

CRYSTAL™

(It makes GEM shine. . .)
by Jim Thompson

These are the DOS Icons Digital Research forgot when they wrote GEM. It's too bad Atari didn't put **CRYSTAL** into the TOS ROM's, because for about 30K of code, **CRYSTAL** gives TOS the most powerful features of MS-DOS. Plus, you never lose the look and feel of GEM. And since **CRYSTAL** is a desk accessory, it's always available.

In fact, these eight icons will eliminate all the frustration you feel from not having powerful DOS functions available from within your favorite GEM program (or the desktop)...

Of course, **CRYSTAL** is compatible with all monitors, all disk drives, and all printers.

Make your personal version of GEM shine—for $24.95.

CRYSTAL
ST0229 $24.95

"The best utility buy of the year. without a doubt."
—Current Notes

ADD A WORLD OF ***DOS ICONS*** *TO ALL OF YOUR GEM PROGRAMS.*

- **RENAME files singly or batch**
- **COPY files**
- **CREATE and DELETE folders**
- **FORMAT disks**
- **MOVE files in and out of subdirectories or to other disks**
- **DISK LABELS printed automatically**
- **TEXT FILE FORMAT and PRINT using headers, footers, and page numbers**
- **DELETE files**

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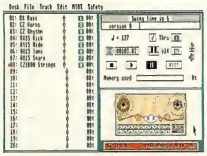


The 20-track polyphonic MIDI recorder for the Atari ST.

EZ-Track™

This is the finest, moderately-priced MIDI software we've seen—and by an experienced firm with a strong music background. Easy to use, but no toy! With EZ-Track, you can make multitrack recordings in real time or step time, save them to disk, then play them back in perfect sync. Professional features include: Real-time solo and muting of tracks, quantizing (auto-correcting) of timing, instant transposition of entire song and much more. Memory capacity is over 27,000 notes on the 520ST and over 63,000 on the 1040ST—very flexible MIDI control.

TH9029 $65.00

The patch librarian, editor and sound generator for the CASIO CZ synthesizer series and Atari ST.

CZ-Android™

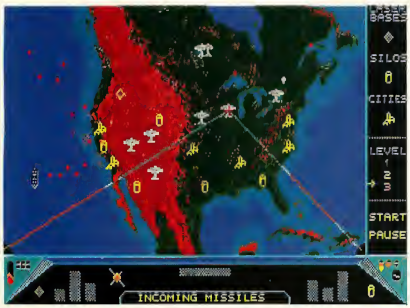
Completely professional MIDI software designed specifically for your CASIO CZ synthesizer. CZ-Android actually **helps you program** your CASIO CZ synthesizer. Then save thousands of your lush new patches with the 20,000-patches-per-disk librarian. Plus, you can edit all CZ parameters either **graphically** or numerically. The unique **Android programmer** lets you listen to thousands of new, original sounds and select the ones you like: to use right away, for graphical editing, or to save for later use. Get the most out of your instrument!

TH9031 $99.95

MIDI CABLES

High-quality MIDI spec. cables in 5 foot length.

TH9032 $3.95 each



MISSILE COMMAND™ MEETS SDI—WITH A TWIST.

RED ALERT™

by Stanley Crane and Daniel Matejka

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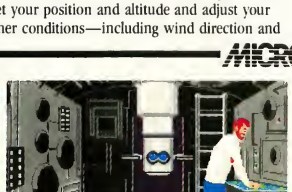

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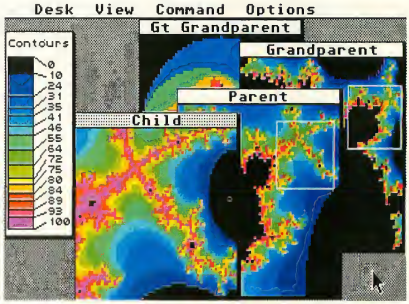

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by Dan Matejka

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(requires CAD-3D ST0214)

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