NO. 52
MARCH 1987

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THE #1 MAGAZINE FOR ATARI® COMPUTER OWNERS

ANALOG COMPUTING™

ENTERTAINMENT ISSUE:

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Inside Infocom, Inc.

Devil's Doorway

Midas Maze

Rambug II

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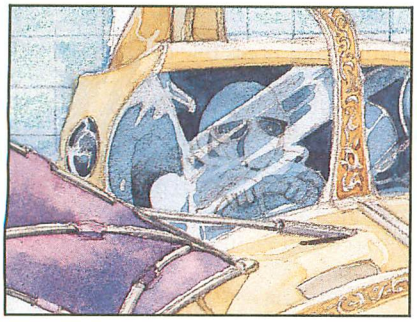

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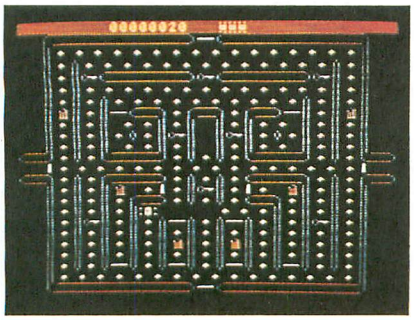

Zip through a maze in search of gold—but beware the robots hunting for intruders...

FEATURES *continued*

REVIEWS

COLUMNS

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AUTHORS

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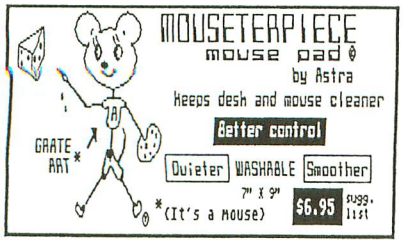

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Editorial

It has always struck me as strange that entertainment software (and the machines on which it's most suited to run) is treated with such disdain. Somewhere along the line, leisure computing became an activity in which few people would willingly admit to participating. This gave rise to a population of closet gamesters who, by day, frown and harrumph at any software not resembling Lotus 1-2-3, and, by night, perch before their monitors (after making sure all the shades are down), grinning as they twist the handles off of innocent joysticks. It's okay to spend six hours preparing a spreadsheet template, but mention a session with **Star Raiders**, and you'll see the eyebrows go up.

Let's step back to the beginning, shall we? Remember the first time you laid eyes on a **Pong** game? I do. I stood there pumping in quarters and muttering things like, "I knew that computers could keep track of payrolls and do word processing, but this is amazing!" Back then, the fact that computers had entered the entertainment industry was something to be proud of. After all, any old machine could handle your taxes, but it took a dynamo to run graphically oriented software.

Yet, as more and more computer arcades popped up (and ever-increasing numbers of quarters vanished from kitchen cookie jars), the amazement got misplaced, and the puritan notion that fun was a cancer to the soul filled its empty slot. Work was where computers belonged, and work was serious stuff, requiring serious individuals with serious machines. So, any computer which was associated with entertainment lost credibility in the corporate world. Too bad, because those machines were capable of sophisticated tasks.

Now, in our newly "enlightened" era, when the importance of graphics in software is coming to the fore, the so-called game machines are gaining a long-awaited —and well-deserved—respect. These are machines that can do more than spreadsheets and word processing. These are machines that can display three-dimensional graphs, that can organize data in attractive, fully-colored charts, can print text in myriad fonts. And nothing has contributed more to the advancement of computer graphics than the entertainment software. Those "silly" games forced our computers to show off capabilities we never dreamed existed, and the business community took note. . . and learned.

We at **ANALOG Computing** are proud of our contributions to the entertainment software industry. Since issue 1, our games have been among the best to be found between the covers of any magazine—and we're not about to stop yet.

Therefore, we officially dub March 1987 National Entertainment Month. This does not mean you have to put away your word processors and databases till April. What it does mean is that you should be proud of the fact that your computer is a game machine (among other things). You should realize that any computer capable of transporting you into the world of **BoulderDash** or **Ultima** is at the top of the heap, not the bottom.

This month, we dug deep into our files to bring you hours of addicting, quality entertainment. **The Devil's Doorway**, for instance, is one of the most original game concepts we've seen in a long while. And it shows that BASIC games can be every bit as exciting as their machine language cousins. **Midas Maze** adds a bit of freshness to the old "gobble the dots" scenario, leading you on a crazy and nerve-wracking maze race.

Speaking of nerve-wracking, **Rambug II**, by our Midwest Editor Matthew Ratcliff, is sure to make you work up a sweat, as you battle furiously to rid your computer of hundreds of electronic bugs (they're not only dangerous, they're ugly!)

If that isn't enough for you, we've got our usual array of utilities, tutorials and hot news. Learn about your computer; catch up on the latest from Atari; discover which products are worthwhile investments and which aren't.

But, most of all, have fun.

Clayton Walnum
Technical Editor
ANALOG Computing

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Reader comment

Correction for *Tablet Typist* and *Slither*.

Some extraneous data got tacked onto the end of issue 51's **Tablet Typist**, Listing 1. Just ignore everything beyond Line 1870. Also, the last number in the last line of the **Slither** listing should be *917* instead of *873*.

Fortune Wheel-ing.

I am enclosing a few lines of BASIC code that will enhance the program **Fortune Wheel** from your December issue. These lines will make a normally addicting program into a *very* addicting program. I hope your readers will agree.

```
201 POSITION K5,K4:? "$";T
PM(K1):POSITION 27,K4:? "$
";TPM(K2)
505 ON ROUND GOSUB 31110,3
1120,31130
590 MNY=VAL(MNY$)
31110 SP$="400 100 300 150
 350 TURN200 450 100 350 1
50 FREE550 450 200 175 250
 TURN425 225 100 175 1000B
ANK"
31115 RETURN
31120 SP$="800 200 500 300
 700 TURN400 900 200 700 3
00 FREE1500900 500 350 500
 TURN850 450 200 350 1000B
ANK"
31125 RETURN
31130 SP$="1000400 BANK600
 1400TURN800 1800400 14006
00 FREE300018001000700 100
0TURN1700900 400 700 5000B
ANK"
31135 RETURN
```

Now for the *whys* and *wherefors* of these changes.

The addition of Line 201 will keep a constant on-screen display of the two players' current standings. It is only updated at the end of each round.

Lines 505, 590 and, 31110 to 31135 work together in allowing for progressively larger payoffs. One advantage to this is in giving a player being shut out an opportunity to stage a dramatic third-round comeback and win the right to go to the Big Board. Besides, I like large payoffs, even if they're only make believe.

Keep up the good work and bring us many more programs like **Fortune Wheel**. That sucker *is* addicting!

Sincerely,
Richard Strecker, President
Lake County Atari Computer Enthusiasts

A graphic response.

I wanted to thank **ANALOG Computing** for printing Bob Whipple's letter concerning our **Print Shop** graphic disks, in issue 47. We have received tremendous response from your readers, especially from other Atari user groups. In fact, the response was so great that we had to order a new lot of disks—consequently, some orders were delayed a few weeks. Our backlog has finally been filled, and we are currently assembling our fourth volume of graphics, which will be available by April. Thanks for all the support.

Sincerely,
Forrest Blood, President
Jersey Atari Computer Society
Clementon, NJ

For those of you without issue 47, the disks were $10.00 each. Write to JACS, P.O. Box 710, Clementon, NJ 08021. —Ed.

Foreign relations.

For over a year I've been trying to make contact with Atari users in America, in every possible way I know. I even wrote to the American Embassy. But still I haven't made any contact. I don't know if this is the right way, but I would like to ask if you could put me in contact with any American users.

I'm the owner of an Atari 800XL (256K), 1050 disk drive with Happy enhancement. The main reason for asking is that I would like to exchange information and tips. I have already made contact with Atari users in England, Germany, Belgium, Italy and even in Malaysia. So I hope that you can help me. . .

Your faithfully,
Rob Rachota
vd. Boschstraat 251
2595 AC The Hague
Netherlands

For quite some time now, we, the Birmingham Atari User Group here in England, have been trying to set up a link with our bulletin board to one across the Atlantic. But the difficulty is finding someone who is just as keen to do the same thing.

The idea is to transfer messages from our country to yours via the two bulletin board systems. This, in turn, would create many friendships between our countries.

The messages would be a disk transfer by airmail post, so that the cost is kept to a minimum, and the frequency of transfer would be by the arrangement of each individual SYSOP. The bulletin board software that we use is FoReMXL 8-bit, and any SYSOP in your country will need to know this, as message bases need to be compatible.

Should we get a number of replies, then

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we will pass these on to other interested Atari bulletin boards here in England, who are just as interested as we are. Would any SYSOP who is interested in this great idea please reply to this address?

Yours sincerely,
Mick Coleman
SYSOP of the C.B.A.B.B.S.
30 Daimler Road
Yardley Wood
Birmingham, B14 4JJ, U.K.

We were moved by a recent letter in your **Reader comment** from Mark Horski of Poland, who was having some trouble finding references on PEEKs and POKEs for his 130XE. He said that there wasn't much Atari software in Poland, either. So, we at SPACE (St. Paul Atari Computer Enthusiasts) thought we would cook up a little Christmas present for Mark. Please see the enclosed letter we sent to Mark along with the present. We thought you'd like to know.

Sincerely,
Bob Floyd, St. Paul ACE
Maplewood, MN

"Dear Mark: We saw your letter requesting information on the Atari's PEEKs and POKEs in the December 1986 (issue 49) **ANALOG Computing** magazine. So, as an Atari user group, we thought we would send you the best book on the subject, *Mapping the Atari* (revised edition), by Ian Chadwick. We have also enclosed a DOS 2.5 disk (DOS 2.0 on back), the Atari translator, a public domain player for AMS (Advanced Music System) and 1 double-sided disk of Christmas songs to go with it. Also, we have enclosed 5 double-sided disks of public domain software from our club's disk library (8 disks total). Some disks use BASIC and some are machine language. All of the disks will auto-boot (usually to a menu), but you may or may not have to hold down the OPTION button on your 130XE. Please write if you have any questions on the disks."

Mark's letter to **ANALOG**: I've recently received some letters from the U.S.A., from Atari users. Thus I've learned that you were so kind as to print my letter in your December issue. It is a great and fabulous surprise for me! Thank you very, very much. My new friends in the States offer some interesting programs and books. So I hope I'll receive some software soon. Thanks to you, I have also received letters from Belgium, West Germany and Canada. I have three *Antic* issues, two **ANALOG Computing** issues and four of *COMPUTE!* I find **ANALOG** best. "Type-in" programs are also more interesting. Some weeks ago I have received your issue 47, and I'm very fond of it.

About me: I am working now at DLIs (Display List Interrupts). Your issue 47 contains some interesting information about them. I try to create interesting screens, mixing together graphic modes 0, 3 and 8. It is difficult, but very interesting. I can do some simple changes in DL now. I also try to add some sound to my own graphics. Adding sound to my program drawing sin and cos functions was easy, and the effect is interesting.

I have also learned about shutting off the ANTIC chip via POKE 559,0. It speeds some programs. As you can see, I am a real computer fan. My favorite games are text and graphics adventures. These games "force" me to even think in English, so I hope to speak (and write) English better than now.

I would like to thank you again for your kindness very much. Please accept my best wishes for you and for your great magazine. Long live **ANALOG**!

Yours truly,
Mark Horski
Chorzowska 17/19
44-100 Gliwice, Poland

Glad we could help, Mark. And we're happy to see the Atari adventure is being shared. —*Ed.*

ST-disturbance.

I am writing to you with deep disappointment. I have just purchased the January issue of **ANALOG Computing** and have read through it. I was most distressed, upon reading the editorial page, that you have taken out **ST-Log**. As you state, if I had read the cover very *carefully* (emphasis yours), I would have noticed this fact. If you do not already know that most people do not read the cover very carefully before buying the magazine, I am going to tell you.

Going deeper into the magazine, I came upon the article by Arthur Leyenberger (page 67). The subtitle of this article is "Truth in Advertising!" Surely you can appreciate my disbelief upon reading that you condemn "misleading/inaccurate advertising." Isn't it possible you are guilty of the very same thing? All along, when I've purchased **ANALOG, ST-Log** was included. Now you tell me I have purchased a magazine that has very little useful information in it, but be happy because I can now go out the buy the magazine I thought I was getting in the first place.

Having just purchased an Atari 520ST, I had considered subscribing to your magazine. I can assure you I am giving it greater consideration and less action. As you state, those who subscribed to your magazine were warned in the December issue about the split. Have you so little regard for those readers who purchase your magazine at the newsstand?

I am very disappointed. I thought your magazine an excellent one. I am sorry to see you stoop to such low tricks to sell a few more issues of **ANALOG Computing**.

F.J. Rocal, R.N.

For the last month, ever since my uninformed purchase of the January issue of **ANALOG Computing**, I have been wasting my time hitting the dealers every two or three days, wherever I've bought **ANALOG** in the past, searching for **ST-Log**.

As far as I can determine, **ST-Log** has no distribution in the San Francisco Bay Area. The dealers I visit and the few I've phoned don't have it—and have no idea what I'm talking about. I have several times encountered other, equally vexed ST owners on similar quests.

Stan Farwig
Concord, CA

We don't think we mislead anyone... There were six ST reviews and one ST feature in January's ***ANALOG Computing****. This magazine will continue to cover all Atari computers, while* ***ST-Log*** *will give ST owners machine-specific information.*

As for the availability of ***ST-Log****, we did send promotional materials to our dealers and distributors last October. We found that people were a bit hesitant about carrying the new magazine in any large quantities. Rest assured, we're doing our best to get* ***ST-Log*** *on all our dealers' shelves.* —*Ed.*

The Print Shop and the Panasonic 1080i.

It's a great marriage, but the honeymoon was a bit rough. The relationship started off poorly when I hooked up my new Panasonic KX-P1080i to my Atari 800, by way of an XETEC interface, and attempted to use Broderbund's **Print Shop** to make a card. The results were disastrous. The printer would print two lines of the graphic border, then the print head would make an uncontrolled dash to the right until it crashed into the printer frame. This would

cause the printer to lock up with the error light flashing.

I tried everything to correct this compatibility problem. I flipped dip switches, changed "setup" parameters, tried different cards, and nothing helped. So, as a last resort, I called the toll-free number in the back of the Panasonic instruction manual. From this point on, the relationship did nothing but improve.

The people from Panasonic informed me that they had discovered the problem (after production) and that it was in a ROM chip inside the printer itself. After taking my name and address, they promptly sent me a replacement ROM, at no charge, that completely fixed my problem.

The bottom line is that **Print Shop** and my new Panasonic printer are working together—perfectly. I am very pleased with the support Panasonic has demonstrated by following up with corrections for a single piece of software. I hope this letter will help other readers who use **Print Shop** and purchase a Panasonic 1080i. It is an excellent printer.

Sincerely,
Gerald C. Stafford
Visalia, CA

Keep the 8-bits strong.

Since the emergence of the Atari 520ST, many people have written off 8-bit Ataris as "out-of-date" machines. Following your editorials and the articles from your contributing editors, it is easy to tell that you fully support the 8-bit machines. I appreciate your continued support greatly! Recently, however, I ran across one situation that disturbed me so greatly I felt the need to voice my opinion.

B. Dalton Bookseller recently opened a new chain of software stores called Software Etc. When I went in to look around, I was very upset to find that they didn't have a section for the 8-bit Ataris. They did, however, have a section for the Atari ST computers. What was worse was the fact that they carried books and software for the Commodore 64 and the Apple II series of computers. After seeing this, I decided that it was time to write to the main offices and ask what was going on. I didn't even get an answer to my letter.

I would like to ask all **ANALOG Computing** readers to write a letter to B. Dalton, requesting them to carry Atari 8-bit products. The address is: Software Etc., B. Dalton Bookseller, P.O. Box 1152, Minneapolis, MN 55440. If we don't demand support for these machines, they are sure to die, in no time.

Sincerely,
Perry Robins
Alhambra, CA

Getting into action.

I've used an Atari since 1982, when I got an 800. I bought a 130XE within the last year. My only complaint about it is the keyboard. If I have serious word processing to do, I use the 800; the keyboard is so much better.

I have dabbled with programming and consider myself fair in BASIC. I have Action! and have tried using it. My feelings regarding the language parallel those of Donald Sexauer in issue 46's **Reader Comment**. There's a pronounced lack of after market support for Action!, so I depend on **ANALOG Computing** and others to teach me how to get the most out of it.

Usually though, I spend hours writing, debugging, etc. . . .to find a commercial or public domain package that does what I want better, faster and in less space. I've become more of an "operator" than a "programmer." But I still enjoy program-

ming for the challenge—and would do more, if I felt more confident.

I would like to see **ANALOG Computing** include more utilities and tutorials. And I'd like to see more articles on Action! and unique uses for existing software. One example: using **SynCalc** as a database to keep track of repairs on your car (or cars), prompting you for maintenance items.

This template is one I'm trying to design. Articles like these could create excitement for productivity software already available —and could go a long way in showing the Atari is *not* just a game machine.

Earle West
Deerfield Beach, FL

Voice Master heard from.

We were pleased to see Mr. Ratcliff's review of the **Voice Master** in your issue 47. However, there were some inaccuracies that we would like to respond to.

First, it was stated that **Voice Master** can store 14 seconds of recorded speech information using the extra 64K bank of an Atari 130XE. In fact, more than a minute's worth (70 seconds) of speech data can be recorded into memory! Even with a 48K Atari 800, nearly 23 seconds of speech storage is available, and the Atari 800XL and 65XE will allow for up to 40 seconds. Within the above limits, up to 64 different phrases can be recorded into memory. Additionally, recorded speech files can be saved to disk, then loaded and played back sequentially under BASIC program control.

About the "limited" recognition capability of **Voice Master**, we want to emphasize that recognition accuracy is highly dependent on the user and the vocabulary chosen. For example, the letters *B, E* and *D* sound very similar, and are much more difficult to distinguish between than the words *Bravo, Echo* and *Delta*, which can be recognized with almost 100 percent accuracy by the **Voice Master** when spoken consistently. So useful and practical recognition programs, including data entry programs, can and have been written using **Voice Master**. The recognition capability of our unit is comparable to others costing many hundreds of dollars.

We want Atari users to know that many long hours of research, development and programming effort have been put into our product, to provide them with the best possible speech synthesis and recognition system available at an affordable price.

Sincerely,
Kevin C. Gevatosky
Technical Support
COVOX Inc.
675-D Conger Street
Eugene, Oregon 97402
(503) 342-1271

M/L Editing.

Since I purchased my 800XL two years ago and began learning to compute, the receipt of your magazine has been a welcome event each month. Since my typing is slow, utilities like **M/L Editor** have made loading programs easier to handle. However, I wish to note an oversight.

I recently used **M/L Editor** to type **The ANALOG Computing Database** (issue 47) —approximately one week's worth of free evening time. Twice I was unable to exit the loader by typing *Q*. I could only abort and rerun the program. When I reran it, the line number displayed was one for a previously typed line. After retyping those lines and completing the listing, the **Database** failed to run.

After the second time **M/L Editor** failed to quit, I discovered the culprit. Although **M/L Editor** recognizes the letter key *Q*, it does not allow for *q*. You guessed it, I had accidentally hit CAPS instead of RETURN while loading data. By aborting the loader program as I did, the disk file was not properly closed; and though the data was on disk, it was not recognizable to **M/L Editor**.

So that others may avoid this pitfall, please tell your readers to change Line 320 of **M/L Editor** to read *GOSUB 500: IF A=ASC("Q") OR A=ASC("q") AND X=1 AND NOT EDIT THEN 420.*

Sincerely,
Hal Rinkel
LaPorte, IN

A letter on letters.

A few months ago, an **ANALOG Computing** editorial described the success of people writing to software manufacturers, urging them to support Ataris. Since then, I've written a few letters myself.

The most recent urged Infocom to support extended memory 8-bits. An entire Infocom game in the memory of an 8-bit is now a possibility!

Please, if you have upgraded an 800, 800XL, or a 130XE (or plan to), write software companies and ask them to develop products for these. It only cost me $27.00 to go from a 64K 800XL to a 256K XL. The XEs are easier to upgrade.

The only way we can get support is to show people there's a demand. Get those pens and printers moving!

Mike Haas
Middletown, PA

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8-bit news!

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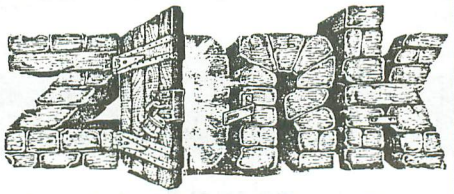
Before there was Lotus 1-2-3, there was **Zork I, II** and **III**. Now, Infocom is offering the trilogy in one package—but not without providing you with three disks, a complete history of the "Great Undergound Empire," the coin of the realm, two semi-luxury resort brochures, and other surprises.

Now, for those of you who don't know about **Zork** *(really?)*, this series has been a top-10 bestseller for more than five years. **Zork I** starts you out on an introductory level, taking you into the underground ruins of an ancient empire. You poke about this magical land in search of the fabulous "Treasures of Zork." You will encounter exotic creatures, amazing sights and troubling puzzles.

"The World of Frobozz" is a long-hidden region of the Great Underground Empire. In **Zork II**, the frivolous Wizard of Frobozz rules,



long after his exile from the Empire. The garden of an elusive unicorn and a maze of strange rooms will confront you—as well as the Wizard's bothersome spells. **Zork III: The Dungeon Master** brings you to the deepest and most mysterious reaches yet.

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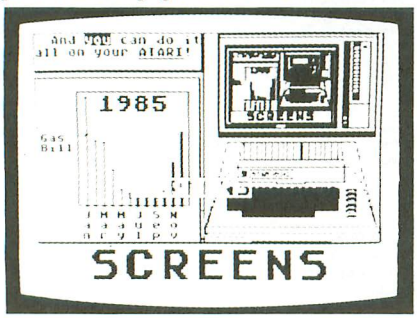

Further information can be obtained from The Soft Cellar, P.O. Box 16393, Rochester, NY 14616-0393.

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The **X-10 Powerhouse** gives you and your Atari the ability to control various appliances and other devices in your home or office, in addition to the lights. The **X-10** connects to your computer console and, via the electrical wiring already existing in the building's walls, communicates to **X-10** control modules wherever you choose. The Power Manager program does all the work.

Priced at $119.95. Terrific Peripherals, 17 St. Mary's Ct., Brookline, MA 02146 — (617) 232-2317.

CIRCLE #149 ON READER SERVICE CARD

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BUFFALO, NEW YORK
Buffalo Convention Center
Convention Center Plaza, Downtown
For more information, contact:
Great Lakes Atari Expo
P.O. Box 294
Buffalo, NY 14216

UPCOMING SHOWS

Additional information will be published in later issues.

MAY 1987
DALLAS, TEXAS

MAY 1987
SEATTLE, WASHINGTON

JULY 1987
CHICAGO, ILLINOIS

AUGUST 1987
DETROIT, MICHIGAN

SEPTEMBER 1987
GLENDALE, CALIFORNIA

FALL 1987
WORCESTER, MASSACHUSETTS

NOT YET SCHEDULED

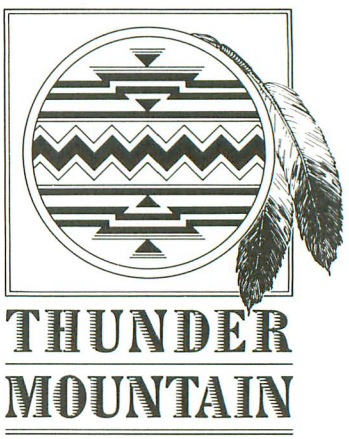
NEW YORK CITY, NEW YORK
ST. LOUIS, MISSOURI

THUNDER MOUNTAIN

No, this isn't a ride at a Disney theme park, but a new line of software from a division of Mindscape. The goal behind **Thunder Mountain** is the publication of top-quality consumer software at fair prices. Titles are selected for their content, quality and value. They are also thoroughly tested and delivered with full documentation at a cost of $9.95 per title.

The Atari 8-bit line includes the **Tink Tonk** series, a collection of educational programs for children 4 to 8 years old. **ABCs with the Tink Tonks** consists of five activities covering the alphabet in its normal order and the computer keyboard layout. **Being a Smart Thinker with the Tink Tonks** assists children in improving concentration, memory and visual discrimination skills. Children learn basic math concepts, with counting and simple addition in **Count and Ad with the Tink Tonks. Develop Thinking Skills with the Tink Tonks** contains five activities that boost a child's logic, inference and critical thinking skills.

In **Songwriter**, anyone age 5 and up can



write and play back music, using piano-roll graphics. **Spelling with the Tink Tonks** provides children with practice in spelling, and builds vocabulary and visual discrimination skills. Finally, **Subtraction with the Tink Tonks** gives an entertaining environment to the chore of practicing subtraction. All of the programs feature high-resolution graphics, or original music and animations, as well as stressing the educational aspects of the software.

For further information on these and other products to be announced, contact Thunder Mountain, P.O. Box 1167, Northbrook, IL 60065-1167, or call (800) 331-5046 (800-654-3771 in Illinois).

CIRCLE #150 ON READER SERVICE CARD

Beach-Head II and Raid Over Moscow

by Andy Eddy

When Access Software came on the scene with **Beach-Head**, they immediately made an impression on Atari users. Since that point, they've been conspicuously absent. With the release of its sequel, **Beach-Head II**, and **Raid Over Moscow**, they have proven that their previous success was no fluke. Their games are textured with multilayered action that allows you no time to sit back on your prior victories. You're forced to pass many tests before you can call yourself a winner. Let's take a peek into what this pair offers.

Raid Over Moscow

by Bruce Carver
ACCESS SOFTWARE
2561 South 1560 West
Woods Cross, UT 84087
48K Disk $39.95

From books to movies, newspapers to computer games, the strongest rivalry in our modern world is that of the U.S.S.R. vs the U.S.A. Whether in cultural differences or defense clashes, this scenario undoubtedly causes hearts to gallop.

Raid Over Moscow brings the conflict onto your screen, as you race against the clock to defeat the Russian defense system and halt incoming nuclear missiles. Before you're victorious though, you must battle through six sequences, enter the Soviet Defense Center and destroy the maintenance robot inside the reactor room. The number of robots you must slay depends on the level you choose. Only the severely masochistic will opt for the nearly-impossible Level 3.

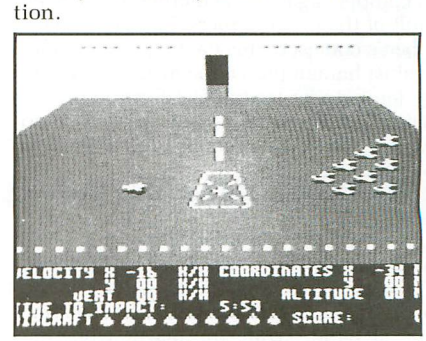
The best feature of Access games is the range of tasks you're faced with. Varied competitions push you in different directions, forcing you to master all types of joystick manipulation. The first task in **Raid Over Moscow** is difficult enough: getting your fighter planes out of the space hangar, so they may start their mission. There's no gravity or brakes; maneuvering your craft is no easy feat as you try to depart through the airlock door.

Meanwhile, ticking away at the bottom of the screen in your command window is the timer that keeps you abreast of how long your country has till meeting its destiny. You must fly your bombers in an offensive against each of the three Communist launch sites before you take on Moscow. When you approach a city, your perspective is changed, to permit a view of the ground targets. From there, you'll try to initiate a strafing assault on military outposts, dodging heat-seeking missiles and attack helicopters on your way to the missile silos themselves.

Once you achieve that goal, it's on to Moscow and into the trenches. As you bounce back and forth to prevent the enemy forces from locking in on you, you need to find the correct door to enter the reactor. This door changes from game to game. It is, in fact, an almost insurmountable barrier, in light of the fact that tanks and soldiers scan the perimeter for your presence. A gauge in your command window gives you a lock on the range of your gun, and utilizing your joystick to change the firing angle varies the distance of your shots. Assisting you is an indicator which tells you when you're on target, but remember, he who hesitates is lost. Your wily adversary takes no time at all to zero in and pick you off.

If you're successful enough to reach the final stage, you'll be able to sneak into the Soviet power plant and get a shot at taking out the sentry robot who maintains the reactor equipment. Disrupting his routine will cause the plant to go critical and explode. Reminiscent of combat in *Tron*, you toss disc grenades at the automaton. Since he's impervious to frontal attack, you're forced to bounce discs off the back wall to strike the robot from behind.

This can be difficult, due to his assault on you and his erratic movement throughout the reactor room. Of course, the last robot will be the most elusive of all targets. If you should be victorious in defeating the necessary number of robots, you'll escape with your life and go home knowing you saved your country from certain destruction.



Raid Over Moscow — **heating up the cold war.**

I realize this sounds like standard fare, but attention to detail makes this contest rise above the mundane. By not boring the player with repetitious undertakings, the

game urges you to try harder and to come back should you be defeated—which happens more often than you might hope.

Another nice feature, one not found on other games, is the demo mode. While many programs show off the game via computer-controlled display of the various playing segments, none that I can recall allow you to take control and interact. This creates a practice mode. If you let the computer pass through the demo until it reaches a section you're having difficulty with, you can move the joystick to take control of the plane or soldier.

Plain and simple, **Raid Over Moscow** is a demonstration of what computer gaming enthusiasts hope for when they shell out their hard-earned cash.

Beach-Head II

by Roger and Bruce Carver
ACCESS SOFTWARE
2561 South 1560 West
Woods Cross, UT 84087
48K Disk $39.95

Over the years, sequels have often been half-baked efforts to emulate their originals. With the release of **Beach-Head II**, though, it's obvious that the Carvers were not content with their initial effort; they were determined to surpass it. And again, they've beaten the odds, writing another game that'll leave your joystick smoking.

Subtitled "The Dictator Strikes Back," **Beach-Head II** transports you back to July, 1947. The maniacal rebel known as the Dragon has eluded defeat over the years, and the allies have sent J.P. Stryker, their youngest commander, to bring an end to the Dragon's reign and retrieve the hostages holed up in his fortress. These two military masterminds are forced into a battle to the death, to determine who will be victorious.

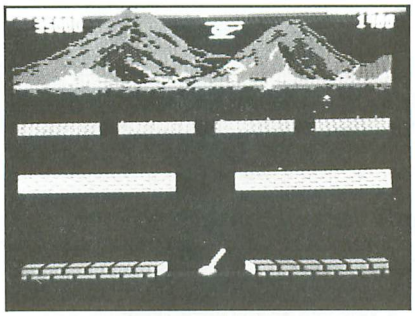
The game's head-to-head confrontation is brought to fruition by enabling a single player to take either role and go up against the computer, or by allowing two players to compete against each other. It's not the fault of the programmers, but most times, when a contest of this nature pits computer against human player, the machine's strategy tends to be too perfect for good competition—there are too few weak spots to exploit. This game hits its high when two players clash.

Beach-Head II, like **Raid Over Moscow**, is designed to bring out a variety of strategies. It starts with the allies unloading paratroopers near the Dragon's fortress. Whoever is playing the Dictator tries to pick off these soldiers with the machine gun at hand, while the player who represents Stryker must maneuver the surviving paratroopers in an attempt to destroy the gun and enter the complex where the enemy is holding the hostages.

Once inside, Stryker must escort the prisoners through the courtyard, guarding them with the captured machine gun. It's a good thing he has that weapon on his side, as the Dictator throws everything but the kitchen sink at the captives. There's a tank trying to run them over, a truck with a rocket launcher, a man planting mines from a trap door, and a guy tossing rocks from atop the wall.

Sequence 3 is much like **Zaxxon**, where the ally must take hostages out of the Dragon's bastion by helicopter. There are three difficulty levels (each with increased enemy speed) that must be worked through. Since the increase in difficulty will lessen your chances of passing through this section unscathed, it's best to have more passengers in your 'copter at the easiest level. Unfortunately, you can't tell which level will come when, so you don't know how many hostages to put into each plane. If you aren't successful in taking any of your people out to safety, the game ends.

Finally, should you make it that far, the last phase sets Stryker against the Dragon, each character standing on his own platform over a river. The object is to strike the opposing player by tossing heavy sticks across the canyon. Four hits will send the player into the water, and whoever scores the most points over nine rounds will win. Simple, huh? Sure...



Beach-Head II **has a convenient practice mode.**

What you get when you buy **Beach-Head II** is actually four games in one. Each contest is scored and recapped following the section's completion, so you can keep track of your progress. If a level is giving you problems, there's a practice selection that enables you to choose which segment you'd like to work on. Thus, you're not forced to play through an entire game to reach that competition. It's a good way to brush up on your technique.

These games both utilize the graphic and sound capabilities of the Atari computer to the maximum. Running through the pair, I found it hard to stay alive at anything but the easiest level. Since both contests can be taken two levels further in difficulty, there's room for the most experienced player to grow. Just the same, I find it increasingly more arduous to keep the games out of my disk drive. By the way, who said the 8-bit market was dying?

GEnie

GENERAL ELECTRIC INFORMATION SERVICES
1-800-638-9636, ext. 21
$18.00 sign-up with manual

by Andy Eddy

On October 21, 1985, General Electric Information Services started offering their **GEnie** service to personal computer owners. Even though the layout of the system is similar to those of some competitors, certain features have been enhanced to make them more user friendly. Starting small has given the originators a chance to polish details without being overwhelmed by massive system operations.

For $5.00 an evening hour, 300- or 1200-baud users can access a potentially powerful system. The day rate is a staggering $35.00 per hour, but most personal computer users on the service avoid this time period—for obvious reasons. A 2400-baud capability is available, albeit at a $10.00 surcharge over normal rates, on a limited basis; call for details on whether it's available in your area.

GEnie is a flexible system. It gives the user—whether experienced or beginner—the opportunity to tailor it to his or her needs. As an example, each menu on the service is considered a "page" for the user to "turn to." If you wanted to go to the GE Mail service, you would simply enter the command *Move 200* at any prompt, page 200 being the location of the mail menu. To take this a step further and specify selection 3 on that menu, typing *Move 200;3* would execute that choice without a menu display.

The Move command can even be initialized at log-in. Typing in the destination page just after the password (in the same format as above) will take you to that location when you enter **GEnie**. This offers you the ability to bypass the main menu and reach a desired function, without the waste of on-line time found in some networks. Once you get used to traveling through the system, the "command" mode offers the most rapid movement, by cutting off the printing of the menu to your screen. Instead, you are given just the current page location and a prompt.

At present, one of the most popular aspects of a telecomputing network is that portion which caters to special interests. Groups can get together for problem solving, hardware/software discussion, teaching, or just about anything that folks will do when they congregate with a common hobby. On **GEnie**, this comes in the form of the "RoundTable."

RoundTables are intended to encourage people to get together for national discussion and messaging, as well as to exchange ideas and programs. With Atari 8-bit and ST RoundTables in existence, both run by Bob Retelle, Atari users have available to them a wealth of information and programs. At the time of this writing, **GEnie** was sporting Atari software libraries of over one thousand 8-bit and over six hundred ST titles. These numbers were quite a bit lower until a test run that allowed uploading of programs without an on-line charge. Since that time, the organizers have determined that free uploading benefits everyone, so they've instituted the policy as a permanent part of the system.

RoundTables also are equipped with a powerful bulletin board service for topics to be raised and discussed, whether it's a question or problem concerning a peripheral, or a rave about a product. This is the best way for new information to be disseminated between users. SIGs are credited with breaking news of many solutions to hardware problems—long before the information could be passed on to a buyer through normal channels.

Virtually all of the consumer-oriented services offer some sort of two-way conversational environment. Undoubtedly, each on-line network's introduction has brought with it new commands and controls to broaden the power of this popular feature. While **GEnie**'s "LiveWire CB Simulator" is very similar to most offered on other networks, their "National Real-Time Conference" (RTC) is a divergent form of the same concept.

The RTC set-up, while very much like LiveWire in user interfacing, is much better suited to handling meetings or conferencing. Whether it be a meeting of a user group or an interview with a celebrity, RTC allows a designated "meeting leader" to control the action. A complement of commands give the leader the option of having attending members able to ask questions, or, like a lecture, capable only of listening. For example, if you have a question to ask, you may have to signal by "raising your hand."

If a private meeting is in order, a sign can be posted on the "door" stating that fact, and all those who try to enter can be greeted by a message explaining that the meeting is already in progress. The leader might even wish for prospective entrants to "knock" before gaining entry, or restriction can be enforced through the use of a password.

Enabling the leader to shape the meeting is a great way to get organized forums across to people most likely to appreciate the content. The service has even gone so far as to offer an "electronic stenographer" to record meetings, with notes sent to the

leader's mail address for editing. These notes can then, in turn, be distributed to members for their records.

The Atari RoundTable meets regularly on Wednesday nights for on-line discussion of pertinent topics. While this forum is basically new, it has strong support from the users of Atari products. The schedule of meetings may change, depending upon whether splitting time between 8- and 16-bit camps becomes a problem. Retelle did mention the possibility of a rotating schedule, with ST users meeting on one week and the 400/800/XL/XE group meeting on the next. The issue may be settled by the time you read this.

What we see here could be the future of user groups; no considerations need to be taken for distance traveled to a meeting or weather conditions. Groups don't have to bear the brunt of a guest speaker's travel expenses to have someone join in on a question-and-answer session. Truly national user groups have become entirely feasible with the advent of this technology.

RoundTables and RTCs aren't the only ways to attain high-tech knowledge. A news and information section includes a column by Charles Bowen, "A Networker's Journal," which is devoted to discussion of the telecomputing field. For lighter tastes, movie reviews and Hollywood highlights are available. For serious researchers and students, **Grolier's Encyclopedia** can be scanned to find listings on many subjects. Quite a few other sections are available, and the management of **GEnie** is constantly searching for additional databases to satisfy their subscribers' varied interests.

Their marketing technique is perhaps the most innovative feature of all. By hooking into a toll-free number set up for potential customers, you can run through the system on a limited basis. This sample is restricted mostly to viewing the main menus of each feature contained in the network and is the quickest method of signing up for the service. This arrangement is a great way to get an idea of what services will interest you *before* you spend your money.

To access the system, you simply call 1-800-638-8369 and wait for the tone that indicates a connection to the system. Type in *HHH* and RETURN, which allows **GEnie**'s computers to determine your operating speed. They will respond with *U#=*. This is the prompt for the sample user number and password, which is entered as *5JM11999,GENIE* and a RETURN. If you have any problems or questions, you can call the customer service line at 1-800-638-9636, extension 21. It's nice to know they're there if you need to get advice or particulars on the system.

Once in the system, you will be briefed on the basics and brought to the main menu as a starting point. You are allowed a 5-minute time limit, but you may repeat this process if you wish. If you'd like to sign up, you'll be able to do so here, and the cost is quite reasonable—for $18.00 the manual is included. The mailing of this useful book is immediate; I had mine in my hands within the week. In binder form, it's easy to keep current, as updates and additions are periodically sent out.

GEnie access is very much like dialing up any other on-line service, but in this case you can only reach them through their *own* phone network—a local call in hundreds of cities. Using their established phone system and avoiding the extra charge of a separate phone network (like Tymnet) enables them to pass the savings on to you.

This review covers the more substantial offerings on the system, but more is available in the way of games, shopping services and diverse RoundTables, with further additions coming regularly.

There is no question that the creators of **GEnie** tried their hardest to come up with an alternative in on-line access. Whether they listen carefully to the questions and advice of consumers is left to be seen. After all, the voice of the customer is the backbone of these companies.

Andy Eddy works as a cable TV technician in Connecticut, but has been interested in computers since high school. While his family's Atari 800 is four years old, he's been avidly playing arcade games since ***Space Invaders*** *and is a former record holder on* ***Battlezone****.*

M/L Editor

For use in machine language entry

by Clayton Walnum

M/L Editor provides an easy method to enter our machine language listings. It won't allow you to skip lines or enter bad data. For convenience, you may enter listings in multiple sittings. When you're through typing a listing with **M/L Editor**, you'll have a complete, runnable object file on your disk.

There is one hitch: it's for disk users only. My apologies to those with cassette systems.

Listing 1 is **M/L Editor**'s BASIC listing. Type it in and, when it's free of typos, save a copy to disk, then run it.

On a first run, you'll be asked if you're starting a new listing or continuing from a previously saved point. Press *S* to start, or *C* to continue.

You'll then be asked for a filename. If you're starting a new listing, type in the filename you want to save the program under, then press RETURN. If there's already a file by that name on the disk, you'll be asked if you wish to delete it. Press *Y* to delete the file, or *N* to enter a new filename.

If you're continuing a file, type in the name you gave the file when you started it. If the program can't find the file, you'll get an error message and be prompted for another filename. Otherwise, **M/L Editor** will calculate where you left off, then go on to the data entry screen.

Each machine language program in **ANALOG Computing** is represented by a list of BASIC data statements. Every line contains 16 bytes, plus a checksum. Only the numbers following the word *DATA* need be considered.

M/L Editor will display, at the top of the screen, the number of the line you're currently working on. As you go through the line, you'll be prompted for each entry. Simply type the number and press RETURN. If you press RETURN without a number, the default is the last value entered.

This feature provides a quick way to type in lines with repetitions of the same number. As an added convenience, the editor will not respond to the letter keys (except *Q*, for "quit"). You must either enter a number or press RETURN.

When you finish a line, **M/L Editor** will compare the entries' checksum with the magazine's checksum. If they match, the screen will clear, and you may go on to the next line.

If the checksums *don't* match, you'll hear a buzzing sound. The screen will turn red, and the cursor will be placed back at the first byte of data. Compare the magazine listing byte by byte with your entries. If a number's correct, press RETURN.

If you find an error, make the correction. When all data's valid, the screen will return to grey, and you'll be allowed begin the next line.

Make sure you leave your disk in the drive while typing. The data is saved continuously.

You may stop at any time (except when you have a red screen) by entering the letter Q for byte #1. The file will be closed, and the program will return you to BASIC. When you've completed a file, exit **M/L Editor** in the same way.

When you've finished typing a program, the file you've created will be ready to run. In most cases, it should be loaded from DOS via the L option. Some programs may have special loading instructions; be sure to check the program's article.

If you want the program to run automatically when you boot the disk, simply name the file AUTORUN.SYS (make sure you have DOS on the disk).

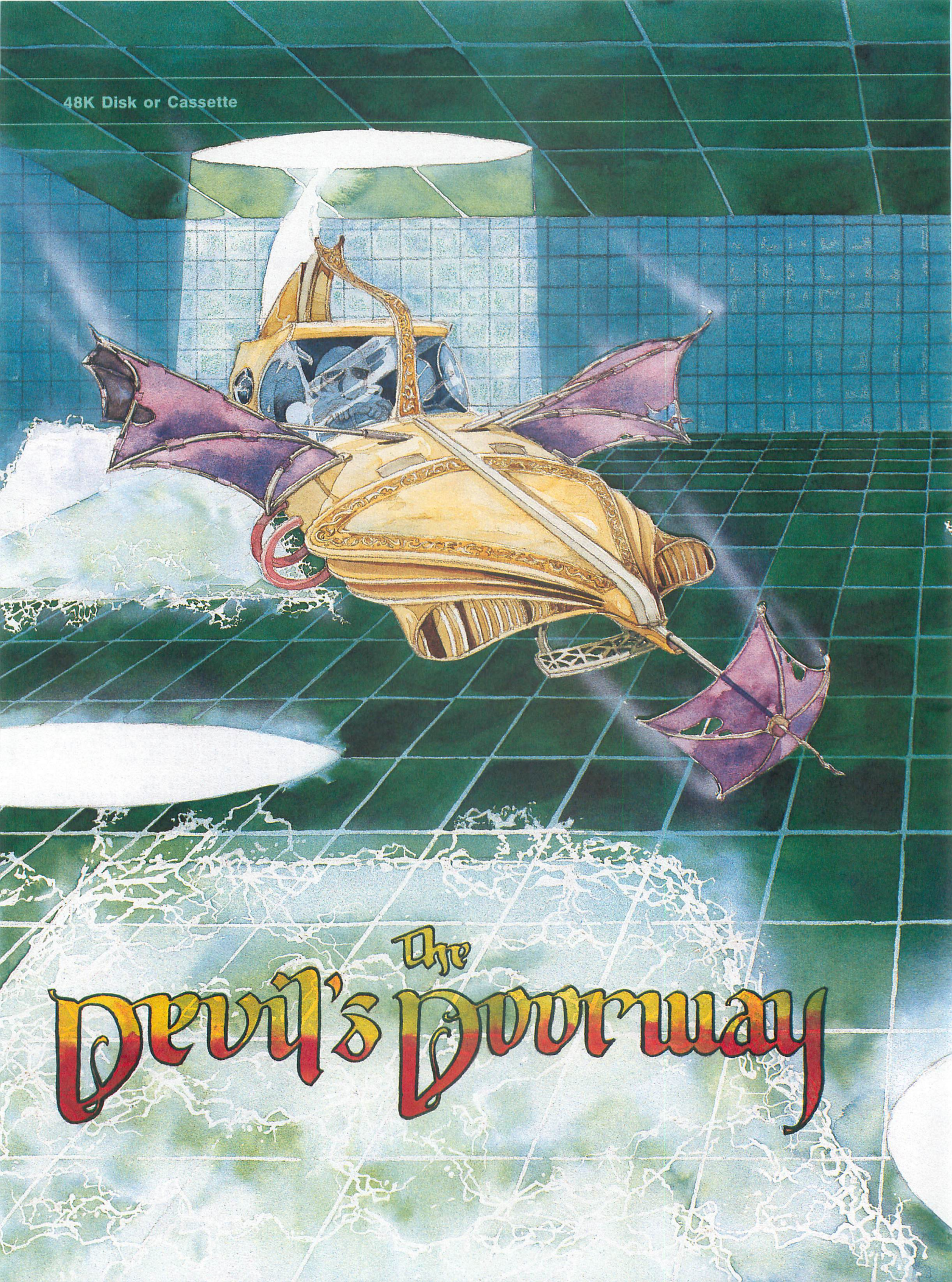
That's **M/L Editor**. Use it in good health.

The two-letter checksum code preceding the line numbers here is *not* a part of the BASIC program. For further information, see the *BASIC Editor II*, in issue 47.

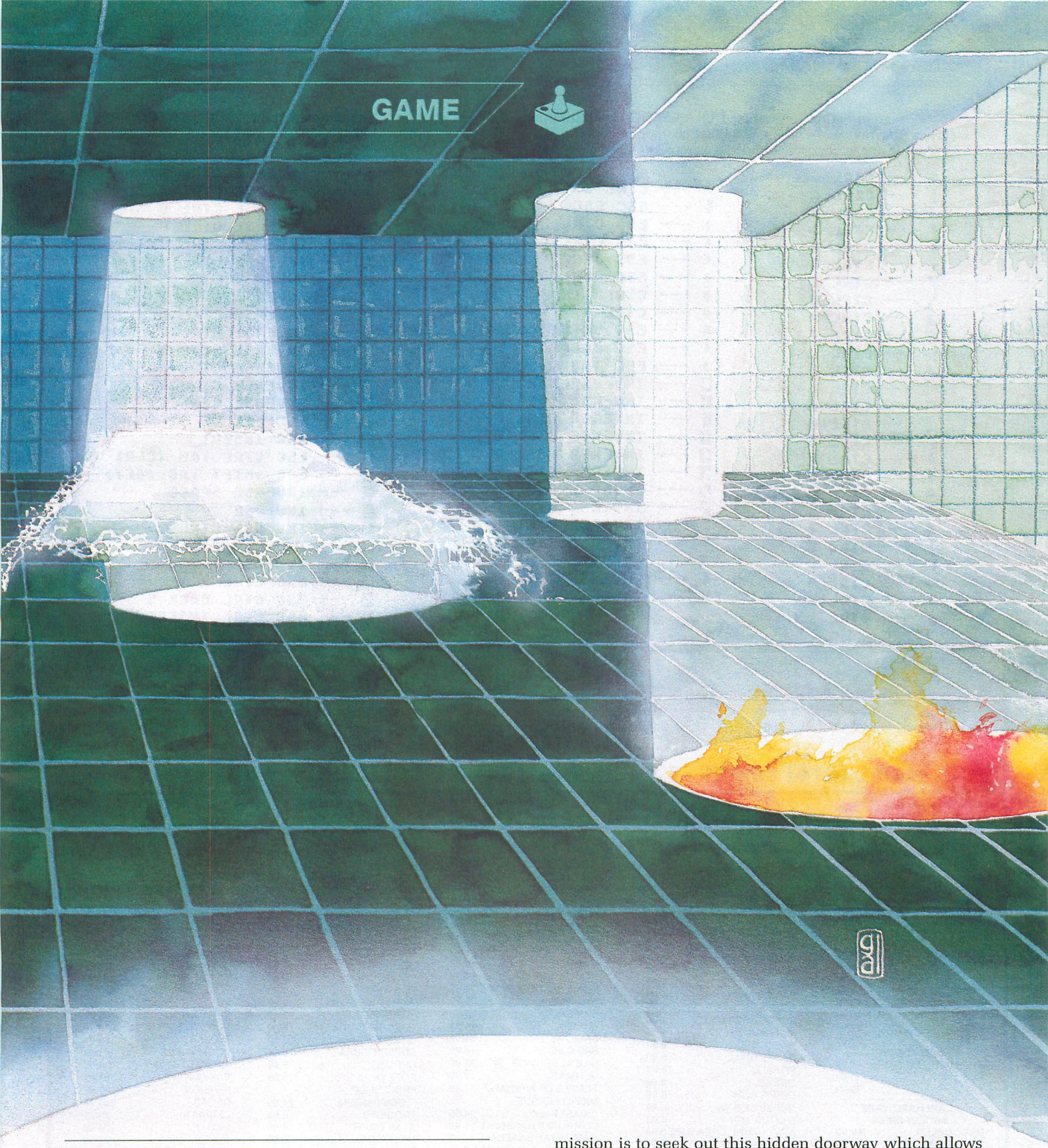
Listing 1.
BASIC listing.

```
AZ 10 DIM BF(16),N$(4),A$(1),B$(1),F$(15)
   ,F1$(15)
LF 11 DIM MOD$(4)
BN 20 LINE=1000:RETRN=155:BACKSP=126:CHKS
   UM=0:EDIT=0
GO 30 GOSUB 450:POSITION 10,6:? "Start or
    Continue? ";:GOSUB 500:? CHR$(A)
ZG 40 POSITION 10,8:? "FILENAME";:INPUT F
   $:POKE 752,1:? " "
FE 50 IF LEN(F$)<3 THEN POSITION 20,10:?
   "  ";:GOTO 40
NF 60 IF F$(1,2)<>"D:" THEN F1$="D:"F1$(
   3)=F$:GOTO 80
KL 70 F1$=F$
TN 80 IF CHR$(A)="S" THEN 120
FD 90 TRAP 430:OPEN #2,4,0,F1$:TRAP 110
HQ 100 FOR X=1 TO 16:GET #2,A:NEXT X:LINE
   =LINE+10:GOTO 100
WM 110 CLOSE #2:OPEN #2,9,0,F1$:GOTO 170
VT 120 TRAP 160:OPEN #2,4,0,F1$:GOSUB 440
   :POSITION 10,10:? "FILE ALREADY EXISTS
   !!":POKE 752,0
ZU 130 POSITION 10,12:? "ERASE IT? ";:GOS
   UB 500:POKE 752,1:? CHR$(A)
VH 140 IF CHR$(A)="N" OR CHR$(A)="n" THEN
    CLOSE #2:GOTO 30
AG 150 IF CHR$(A)<>"Y" AND CHR$(A)<>"y" T
   HEN 130
BH 160 CLOSE #2:OPEN #2,8,0,F1$
IE 170 GOSUB 450:POSITION 10,1:? "NOW ON
   LINE: ";LINE:CHKSUM=0
GH 180 L1=3:FOR X=1 TO 16:POSITION 13*(X(
   10)+12*(X>9),X+2:POKE 752,0:? "BYTE #"
   ;X;": ";:GOSUB 310
KH 190 IF EDIT AND L=0 THEN BYTE=BF(X):GO
   TO 210
FY 200 BYTE=VAL(N$)
OZ 201 MOD$=N$
BU 210 POSITION 22,X+2:? BYTE;"  "
YZ 220 BF(X)=BYTE:CHKSUM=CHKSUM+BYTE*X:IF
    CHKSUM>9999 THEN CHKSUM=CHKSUM-10000
MS 230 NEXT X:CHKSUM=CHKSUM+LINE:IF CHKSU
   M>9999 THEN CHKSUM=CHKSUM-10000
IG 240 POSITION 12,X+2:POKE 752,0:? "CHEC
   KSUM: ";:L1=4:GOSUB 310
EW 250 IF EDIT AND L=0 THEN 270
QM 260 C=VAL(N$)
SY 270 POSITION 22,X+2:? C;"   "
IL 280 IF C=CHKSUM THEN 300
DI 290 GOSUB 440:EDIT=1:CHKSUM=0:GOTO 180
LW 300 FOR X=1 TO 16:PUT #2,BF(X):NEXT X:
   LINE=LINE+10:EDIT=0:GOTO 170
FV 310 L=0
LG 320 GOSUB 500:IF A=ASC("Q") AND X=1 AN
   D  NOT EDIT THEN 420
PO 330 IF A<>RETRN AND A<>BACKSP AND (A<4
   8 OR A>57) THEN 320
DX 331 IF A=RETRN AND N$="" THEN N$=MOD$
TD 335 IF A=RETRN AND L=0 AND X>1 THEN 35
   0
JR 340 IF ((A=RETRN AND  NOT EDIT) OR A=B
   ACKSP) AND L=0 THEN 320
DW 350 IF A=RETRN THEN POKE 752,1:? " ":R
   ETURN
GG 360 IF A<>BACKSP THEN 400
SA 370 IF L>1 THEN N$=N$(1,L-1):GOTO 390
AS 380 N$=""
RE 390 ? CHR$(BACKSP);:L=L-1:GOTO 320
BB 400 L=L+1:IF L>L1 THEN A=RETRN:GOTO 35
   0
WX 410 N$(L)=CHR$(A):? CHR$(A);:GOTO 320
KN 420 GRAPHICS 0:END
YT 430 GOSUB 440:POSITION 10,10:? "NO SUC
   H FILE!":FOR X=1 TO 1000:NEXT X:CLOSE
   #2:GOTO 30
FD 440 POKE 710,48:SOUND 0,100,12,8:FOR X
   =1 TO 50:NEXT X:SOUND 0,0,0,0:RETURN
MY 450 GRAPHICS 23:POKE 16,112:POKE 53774
   ,112:POKE 559,0:POKE 710,4
XR 460 DL=PEEK(560)+256*PEEK(561)+4:POKE
   DL-1,70:POKE DL+2,6
HW 470 FOR X=3 TO 39 STEP 2:POKE DL+X,2:N
   EXT X:FOR X=4 TO 40 STEP 2:POKE DL+X,0
   :NEXT X
ZW 480 POKE DL+41,65:POKE DL+42,PEEK(560)
   :POKE DL+43,PEEK(561):POKE 87,0
AC 490 POSITION 2,0:? "analog m1 editor":
   POKE 559,34:RETURN
WZ 500 OPEN #1,4,0,"K:":GET #1,A:CLOSE #1
   :RETURN
```

48K Disk or Cassette



The Devil's Doorway



by David Schwener

Prepare for descent into the unknown! You are poised atop an alien structure called The Grid. As gravity sucks your ship downward, you must steer around the Zappoids, electrically charged barriers which weaken your ship's shields on contact. At the bottom edge of The Grid are twenty portals; behind one lies **The Devil's Doorway**. Your mission is to seek out this hidden doorway which allows you to progress to the next level, with stronger gravity and more powerful Zappoids.

You control your ship's direction with joystick 1. Because gravity is pulling on your ship, your control is limited to right or left only, causing a diagonal downward movement. Your score can only be increased by diagonal movement; direct vertical descent down The Grid does not score points. Upon reaching the bottom of The Grid,

Some program listings reproduced in **ANALOG Computing** may contain "strange" characters not shown on the keyboards of earlier Atari models. These are special characters which use the CTRL, ESC and "ATARI LOGO" (inverse) keys. Shown below is a list of these characters and the keystrokes used to get them.

```
♥ --- CTRL ,
├ --- CTRL A
| --- CTRL B
┘ --- CTRL C
┤ --- CTRL D
┐ --- CTRL E
/ --- CTRL F
\ --- CTRL G
◢ --- CTRL H
▪ --- CTRL I
◣ --- CTRL J
▝ --- CTRL K
▘ --- CTRL L
▬ --- CTRL M
▁ --- CTRL N
▗ --- CTRL O
┼ --- CTRL P
▛ --- CTRL Q
▂ --- CTRL R
╋ --- CTRL S
● --- CTRL T
▄ --- CTRL U
▕ --- CTRL V
┬ --- CTRL W
┴ --- CTRL X
▌ --- CTRL Y
└ --- CTRL Z
ESC ESC
↑ --- ESC CTRL UP-ARROW
↓ --- ESC CTRL DOWN-ARROW
← --- ESC CTRL LEFT-ARROW
→ --- ESC CTRL RIGHT-ARROW
♦ --- CTRL .
♠ --- CTRL ;
▚ --- ESC SHIFT CLEAR
◖ --- ESC BACK S
▸ --- ESC TAB
▒ --- INVERSE CTRL ,
▟ --- INVERSE CTRL A
▊ --- INVERSE CTRL B
▟ --- INVERSE CTRL C
▟ --- INVERSE CTRL D
▟ --- INVERSE CTRL E
▟ --- INVERSE CTRL F
▟ --- INVERSE CTRL G
▟ --- INVERSE CTRL H
▟ --- INVERSE CTRL I
▟ --- INVERSE CTRL J
▟ --- INVERSE CTRL K
▟ --- INVERSE CTRL L
▟ --- INVERSE CTRL M
▟ --- INVERSE CTRL N
▟ --- INVERSE CTRL O
▟ --- INVERSE CTRL P
▟ --- INVERSE CTRL Q
▟ --- INVERSE CTRL R
▟ --- INVERSE CTRL S
▟ --- INVERSE CTRL T
▟ --- INVERSE CTRL U
▟ --- INVERSE CTRL V
▟ --- INVERSE CTRL W
▟ --- INVERSE CTRL X
▟ --- INVERSE CTRL Y
▟ --- INVERSE CTRL Z
▲ --- ESC DELETE
▼ --- ESC INSERT
▶ --- ESC CTRL TAB (CLR)
▷ --- ESC SHIFT TAB (SET)
▊ --- INVERSE SPACE
▁ --- INVERSE _
♦ --- INVERSE CTRL .
♠ --- INVERSE CTRL ;
▕ --- INVERSE |
◰ --- ESC CTRL 2
◀ --- ESC CTRL BACK S
▶ --- ESC CTRL INSERT
```

Devil's Doorway *continued*

your ship will open one of the portals, revealing either a Zappoid or **The Devil's Doorway**. Finding a Zappoid will place you back at the top of The Grid for another try.

Once back at the top, The Grid will indicate if the doorway is to the right or the left of your last attempt. This "clue" is an arrowhead that is randomly placed on The Grid. On your next descent, use the arrowhead to home in on the doorway. For example, if the arrow points right, try to land your ship to the right of your last attempt.

In addition to the clues, one other device will help make your descent a safer journey. You can fire Darterz by pushing the trigger button on the way down. Darterz have two purposes. Because they interfere with The Grid's gravitational field, they slow your descent, which is especially helpful in the higher levels. Second, as they dart horizontally across The Grid, they wipe out all the Zappoids in that row. Unfortunately, the Darterz are not perfected and randomly choose which row to cross. If they happen to pick the same row your ship is on, you'll get blasted back one level. Each level starts out with five Darterz, indicated in the upper left corner of the screen.

The status of your ship's shields is shown at the top center of the screen. When the status shows shields OUT, the next contact with a Zappoid ends the game. Starting a new level rejuvenates your shields, but they won't last as long at the higher levels, due to the more powerful Zappoids. To start on a new level, you must locate **The Devil's Doorway** by landing your ship on the correct portal. You are then awarded bonus points based on the current level and the number of portals opened before the doorway was found.

The Devil's Doorway may be started at any level from one to twenty. At the end of a game you may simply press the OPTION button to continue, or the trigger to restart at level one. You can also press the SELECT button to choose a new level, and the START button to start at the selected level. The game may be paused during descent by pressing any key. Press again to restart.

David Schwener has his B.S. in Industrial Engineering and an M.B.A. He's been programming on an Atari for two and a half years, mainly in BASIC, with some assembly. All royalties from published work now go into his "Jackintosh" fund. He hopes to purchase one of the new Ataris with as little outside income as possible. His wife has the same hope.

The two-letter checksum code preceding the line numbers here is *not* a part of the BASIC program. For further information, see the *BASIC Editor II*, in issue 47.

Listing 1.
BASIC listing.

```
UV 10 REM ========================
PO 20 REM = THE DEVIL'S DOORWAY =
YP 30 REM =          by         =
AF 40 REM =    DAVID SCHWENER    =
UZ 50 REM ========================
TG 70 GOSUB 20000:GOSUB 25000
YF 75 GRAPHICS 17:POKE 756,START/256
CC 77 IF LVL<0 THEN LVL=19
IC 80 POSITION 0,0:? #6;" F ":POSITION 15
   ,0:? #6;"SCORE":POSITION 5,0:? #6;"SHI
   ELDS"
IL 90 GOTO 2000
GY 100 IF G=0 THEN X=10:Y=5:OX=10:OY=5:PO
   SITION 10,4:? #6;" ":GOTO 120
UM 110 X=INT(RND(0)*19):Y=5:OX=X:OY=Y
CX 120 IF LVL>9 THEN 140
LL 130 FOR DLAY=1 TO 100-(LVL*10):POSITIO
   N OX,OY:? #6;"z":NEXT DLAY
YW 140 C=14:R=1:S=SC:GOSUB 450
VS 160 POSITION OX,OY:? #6;"B"
GK 170 LOCATE X,Y,Z:IF Z=216 THEN GOSUB 5
   00:GOTO 110
YO 180 IF Z=113 OR Z=32 THEN 1000
MB 190 POSITION X,Y:? #6;"z"
VW 200 OX=X:OY=Y
DV 205 IF PEEK(764)<>255 THEN GOSUB 3000
XC 210 ST=STICK(0)
GY 220 IF STRIG(0)=0 THEN PUSH=PUSH+1:IF
   PUSH<6 THEN GOSUB 600
UH 230 IF ST=11 AND X>0 THEN X=X-1:SC=SC+
   LVL*5:SOUND 0,100,10,8:GOTO 250
OT 240 IF ST=7 AND X<19 THEN X=X+1:SC=SC+
   LVL*5:SOUND 0,108,10,8
FQ 250 Y=Y+1:SOUND 1,Y*10,10,8
DT 260 SOUND 0,0,0,0:SOUND 1,0,0,0
JM 270 POKE 77,0
NP 280 GOTO 140
CX 450 POSITION C+(S<100000)+(S<10000)+(S
   <1000)+(S<100)+(S<10),R:? #6;S:RETURN
IE 500 SHLD=SHLD+1
MF 510 FOR A=1 TO 7
VH 520 SOUND 0,RND(A)*10,8,12
DT 530 SETCOLOR 4,0,15
BL 540 NEXT A:SETCOLOR 4,0,0:SOUND 0,0,0,
   0
YM 550 IF SHLD>13 THEN POSITION 7,1:? #6;
   "LOX":IF SHLD>15 THEN POSITION 7,1:? #
   6;"OUT":IF SHLD>16 THEN 5000
ZN 560 RETURN
UP 600 STR=STR-1:IF STR<0 THEN STR=0
UL 610 POSITION 1,1:? #6;STR
MT 620 Q=RND(0):IF Q<0.5 THEN 670
MP 630 L=RND(0)*13+5:FOR A=1 TO 18:POSITI
   ON A,L:? #6;"F":POSITION A-1,L:? #6;"B
   ":SOUND 0,L,8,10:LOCATE A+1,L,Z
EH 640 IF Z=122 THEN GOSUB 500:LVL=LVL-2:
   GRAPHICS 49:POKE 756,START/256:GOTO 20
   00
MS 650 SOUND 0,0,0,0:NEXT A
KR 660 POSITION 18,L:? #6;"B":RETURN
VQ 670 L=RND(0)*13+5
MX 675 FOR A=18 TO 1 STEP -1:POSITION A,L
   :? #6;"F":POSITION A+1,L:? #6;"B":SOUN
   D 0,L,8,10:LOCATE A-1,L,Z
EP 680 IF Z=122 THEN GOSUB 500:LVL=LVL-2:
   GRAPHICS 49:POKE 756,START/256:GOTO 20
   00
NA 690 SOUND 0,0,0,0:NEXT A
NX 700 POSITION 1,L:? #6;"B":RETURN
QA 800 IF X>D1 THEN R$=CHR$(156)
RO 810 IF X<D1 THEN R$=CHR$(158)
ZM 820 POSITION INT(RND(0)*19),INT(RND(0)
   *13+5):? #6;R$
ZK 830 RETURN
KP 1000 TRY=TRY+1
FO 1010 IF Z=32 THEN G=0
TQ 1020 IF D1<>X THEN POSITION X,Y:? #6;"
   M":GOSUB 800:GOTO 100
LI 1030 FOR A=1 TO 20:SOUND 1,A+50,8,10
OV 1040 POSITION X,19:? #6;"M":POSITION X
   ,19:? #6;"m":POSITION X,19:? #6;"M":PO
   SITION X,19:? #6;"m":NEXT A
DQ 1050 FOR A=1 TO 15
ZR 1060 SETCOLOR 2,RND(0)*14+1,8:SOUND 0,
```

```
   RND(0)*10,8,10
BB 1070 NEXT A:SOUND 0,0,0,0:SOUND 1,0,0,
   0
WU 1080 GRAPHICS 1+48:POKE 756,START/256:
   SETCOLOR 2,LVL,2
HU 1090 FOR A=19 TO 22:POSITION X,A:? #6;
   "z":POSITION X,A-1:? #6;" ":FOR DLAY=1
    TO 10:NEXT DLAY:NEXT A
PV 1100 IF X=19 THEN X=18
YC 1110 IF X=0 THEN X=1
ZY 1120 IF X>10 THEN GOTO 1160
JV 1130 IF X<=10 THEN GOTO 1140
CX 1140 FOR A=X TO 10:POSITION A,22:? #6;
   "z":POSITION A-1,22:? #6;" ":NEXT A
RE 1150 GOTO 1170
UU 1160 FOR A=X TO 10 STEP -1:POSITION A,
   22:? #6;"z":POSITION A+1,22:? #6;" ":N
   EXT A
XQ 1170 POSITION 6,10:? #6;"          "
YL 1180 POSITION 6,11:? #6;"          "
ZG 1190 POSITION 6,12:? #6;"          "
IL 1200 BON=INT(100*LVL/TRY)
KP 1210 IF BON>999 THEN BON=1000
ZH 1220 FOR A=10 TO BON STEP 10:SOUND 0,1
   9,92,8:C=6:R=11:S=A:GOSUB 450
LC 1230 SC=SC+10:C=14:R=1:S=SC:GOSUB 450:
   SOUND 0,0,0,0:NEXT A
NH 1235 FOR DLAY=1 TO 100:NEXT DLAY
OM 1237 IF STR=0 THEN 2000
FR 1240 FOR B=STR TO 1 STEP -1:SOUND 0,10
   +B,2,8:SC=SC+1000:POSITION 1,1:? #6;B-
   1:C=14:R=1:S=SC:GOSUB 450
AZ 1250 FOR DLAY=1 TO 15:NEXT DLAY
FC 1260 NEXT B:SOUND 0,0,0,0
MG 1300 FOR DLAY=1 TO 100:NEXT DLAY
TV 2000 FOR A=22 TO 4 STEP -1:POSITION 0,
   A-1:? #6;"                    ";
CM 2010 POSITION 0,A:? #6;"          z
        ";
HO 2020 IF A<=19 THEN POSITION 0,A+1:? #6
   ;"BBBBBBBBBBBBBBBBBBB";
KL 2030 IF A>19 THEN POSITION 10,A+1:? #6
   ;" ";
HG 2040 SOUND 0,A,10,8:NEXT A:SOUND 0,0,0
   ,0
AZ 2050 FOR A=22 TO 19 STEP -1
DN 2060 POSITION 0,A:? #6;"qqqqqqqqqqqqqq
   qqqqqq";
DT 2070 POSITION 0,A+1:? #6;"
          ";
FF 2080 FOR DLAY=12 TO 5 STEP -0.5:SOUND
   0,200-A*4,8,DLAY:NEXT DLAY:SOUND 0,0,0
   ,0:NEXT A
DM 2090 GRAPHICS 1+32:POKE 756,START/256
YZ 2100 LVL=LVL+1:IF LVL<1 THEN LVL=1
BL 2110 G=0:STR=5:TRY=0:PUSH=0:SHLD=LVL
RY 2120 SETCOLOR 2,LVL,2
EG 2130 POKE 755,0:? "K":? "          PREP
   ARE FOR DESCENT":?
DR 2140 FOR A=0 TO 19:POSITION A,RND(0)*1
   3+5:? #6;"N":NEXT A
BM 2150 POKE 755,0:? :? :? :? "
      LEVEL ";LVL:?
LQ 2160 D1=INT(RND(0)*20)
FJ 2170 POSITION 1,1:? #6;STR:POSITION 7,
   1:? #6;"ok ":C=14:R=1:S=SC:GOSUB 450
NT 2180 GOTO 100
HY 3000 REM
GN 3005 POKE 764,255
SA 3010 IF PEEK(764)=255 THEN 3010
BL 3020 POKE 764,255:RETURN
KX 5000 ? :? :? :? "          SHIELDS GO
   NE ":?
UJ 5005 FOR I=1 TO 50:SETCOLOR 4,4,4:SETC
   OLOR 2,I,2:SOUND 0,RND(I)*10,8,12
QX 5006 SETCOLOR 4,0,0:NEXT I
TV 5007 SETCOLOR 2,LVL,2:SOUND 0,0,0,0
AB 5008 GOSUB 6000
PK 5010 IF SC>HSC THEN HSC=SC
RI 5012 ? "K          THE DEVIL'S DOORWAY"
YR 5015 ? "          by david schwener":?
RP 5017 ? "           HIGH SCORE:";HSC;
PZ 5018 POKE 53279,8:LV=LVL
NZ 5020 IF STRIG(0)=0 THEN SC=0:LVL=0:SHL
   D=0:GOTO 75
JM 5040 IF PEEK(53279)=5 THEN FOR DLAY=1
   TO 20:NEXT DLAY:LV=LV+1:POSITION 15,14
   :? #6;LV;" ":IF LV>19 THEN LV=0
PA 5050 IF PEEK(53279)=3 THEN SC=0:LVL=LV
   L-1:GOTO 75
CD 5060 IF PEEK(53279)=6 THEN LVL=LV-1:SC
   =0:GOTO 75
QF 5070 GOTO 5020
EG 6000 FOR I=1 TO 12
VT 6005 FOR J=12 TO 0 STEP -1
VU 6010 POSITION D1,19:? #6;"M";
SV 6015 SETCOLOR 3,4,J:SOUND 0,100+I*5,8,
   J:NEXT J:NEXT I:SETCOLOR 3,4,6:SOUND 0
   ,0,0,0
YS 6020 FOR A=19 TO 5 STEP -1
LW 6030 POSITION 0,A:? #6;"  m M M M m M
   M M   ";:POSITION 0,A+1:? #6;"
                ";
CE 6050 FOR DLAY=1 TO 10:SOUND 0,50,8,10:
   NEXT DLAY:SOUND 0,0,0,0:NEXT A
FJ 6060 POSITION 2,7:? #6;"OPTION:CONTINU
   E"
WQ 6070 POSITION 2,9:? #6;"SELECT:CHANGE"
   :POSITION 9,10:? #6;"LEVEL"
DE 6080 POSITION 2,12:? #6;"START :RESTAR
   T":POSITION 11,13:? #6;"AT":POSITION 9
   ,14:? #6;"LEVEL ";LVL
PS 6090 POSITION 1,16:? #6;"trigger:RESTA
   RT":POSITION 11,17:? #6;"AT":POSITION
   9,18:? #6;"LEVEL 1"
AO 6500 RETURN
YO 20000 POKE 106,PEEK(106)-5:GRAPHICS 0:
   START=(PEEK(106)+1)*256:POKE 756,START
   /256:POKE 752,1
ND 20005 RESTORE 20015:DIM M$(38)
UE 20010 FOR I=1 TO 38:READ A:M$(I,I)=CHR
   $(A):POKE 755,I:NEXT I
WK 20015 DATA 104,169,0,133,203,133,205,1
   69,224,133,206,165,106,24,105,1,133,20
   4,160,0,177
FJ 20016 DATA 205,145,203,200,208,249,230
   ,204,230,206,165,206,201,228,208,237,9
   6
CU 20020 Z=USR(ADR(M$))
JX 20030 RESTORE 20070
FH 20040 READ A:IF A=-1 THEN RETURN
SQ 20050 FOR J=0 TO 7:READ B:POKE START+A
   *8+J,B:POKE 755,J:NEXT J
YZ 20060 GOTO 20040
BW 20070 DATA 16,0,126,102,102,102,102,12
   6,0
EQ 20080 DATA 17,0,56,56,24,24,24,24,0
ZN 20090 DATA 18,0,126,126,6,126,112,126,
   0
WT 20100 DATA 19,0,126,126,6,30,102,126,0
KQ 20110 DATA 20,0,6,102,102,102,126,14,0
XJ 20120 DATA 21,0,126,112,126,6,126,126,
   0
YF 20130 DATA 22,0,124,96,126,102,126,126
   ,0
CY 20140 DATA 23,0,126,126,6,6,6,6,0
NZ 20150 DATA 24,0,126,102,60,102,126,126
   ,0
ZD 20160 DATA 25,0,126,102,126,6,126,126,
   0
AS 20170 DATA 28,24,52,114,241,241,114,52
   ,24
ZW 20180 DATA 30,24,44,78,143,143,78,44,2
   4
GA 20190 DATA 33,0,126,126,102,102,126,10
   2,0
```

```
TI 20200 DATA 35,0,126,126,96,96,126,126,
   0
TA 20210 DATA 36,0,124,110,110,110,110,12
   4,0
NN 20220 DATA 37,0,126,96,120,96,126,126,
   0
DK 20230 DATA 38,0,126,126,96,120,96,96,0
WB 20240 DATA 39,0,126,126,96,110,102,126
   ,0
AE 20250 DATA 40,0,102,102,126,126,102,10
   2,0
AF 20260 DATA 41,0,126,126,24,24,126,126,
   0
JZ 20270 DATA 43,0,110,110,120,120,110,11
   0,0
NY 20280 DATA 44,0,96,96,96,96,126,126,0
MH 20290 DATA 47,0,126,102,102,102,126,12
   6,0
TS 20300 DATA 48,0,126,126,102,126,96,96,
   0
LP 20310 DATA 50,0,126,126,102,126,108,10
   2,0
OL 20320 DATA 51,0,126,126,96,126,6,126,0
GN 20330 DATA 52,0,126,126,24,24,24,24,0
FU 20340 DATA 53,0,102,102,102,102,126,12
   6,0
LF 20350 DATA 54,0,102,102,102,126,60,24,
   0
ZS 20360 DATA 55,0,99,99,107,127,127,119,
   0
VP 20370 DATA 57,0,102,102,126,24,24,24,0
GK 20380 DATA 34,24,36,66,255,255,66,36,2
   4
QX 20390 DATA 42,0,0,255,219,165,219,255,
   0
OI 20400 DATA 45,102,195,126,153,231,255,
   165,126
XZ 20410 DATA 49,24,24,24,153,219,90,126,
   255
SW 20420 DATA 56,24,126,102,195,195,102,1
   26,24
OA 20430 DATA 58,124,214,130,84,186,146,1
   6,0
FL 20440 DATA -1
FS 25000 GRAPHICS 17:SETCOLOR 4,4,0:POKE
   756,START/256
QV 25002 OPEN #1,4,0,"K:":POKE 764,255
HS 25005 DIM NAME$(13),R$(1):NAME$="divad
   schwener"
AL 25010 FOR A=6 TO 12:FOR B=1 TO 8:POSIT
   ION A,B:SOUND 0,19,92,8:? #6;"B":POSIT
   ION A,B-1:? #6;" ":SOUND 0,0,0,0
GK 25020 NEXT B:NEXT A
XN 25030 FOR A=4 TO 14:FOR B=1 TO 5:POSIT
   ION A,B:SOUND 0,19,92,8:? #6;"B":POSIT
   ION A,B-1:? #6;" ":SOUND 0,0,0,0
GS 25040 NEXT B:NEXT A
VI 25050 SOUND 0,0,0,0
FM 25060 FOR U=1 TO 18:READ A,B,R$:POSITI
   ON A,B:? #6;R$:GOSUB 25300:NEXT U
VJ 25070 DATA 10,5,v,7,8,o,12,8,y,8,5,d,4
   ,5,t,9,8,r,13,5,',6,5,e,11,8,a,6,8,d,1
   4,5,s,7,5, ,9,5,e,10,8,w,5,5,h,12,5,1
VR 25080 DATA 8,8,o,11,5,i
UZ 25120 SOUND 0,0,0,0
NZ 25130 L=0
JE 25140 FOR A=10 TO 6 STEP -1:FOR B=1 TO
    A:POSITION B,14:SOUND 0,A,8,10:? #6;"
   M":POSITION B-1,14:? #6;" ":NEXT B
OM 25150 POSITION B,14:GOSUB 25320:NEXT A
AI 25160 POSITION 6,14:? #6;" "
DW 25170 FOR A=6 TO 13:FOR B=18 TO A STEP
    -1:POSITION B,16:SOUND 0,A,8,10:? #6;
   "M":POSITION B+1,16:? #6;" ":NEXT B
QK 25180 POSITION B,16:GOSUB 25320:NEXT A
WB 25190 SOUND 0,0,0,0
AZ 25200 POSITION 14,16:? #6;" "
NZ 25210 POSITION 9,11:? #6;"M"
KV 25220 FOR ZZ=1 TO 20:SOUND 0,40,6,10-(
   ZZ/2)
UX 25230 FOR Z=1 TO 3:A=PEEK(708):POKE (7
   08),PEEK(711):POKE 711,PEEK(710):POKE
   710,PEEK(709):POKE 709,A:NEXT Z
LA 25240 SOUND 0,0,0,0:NEXT ZZ
QV 25245 POSITION 3,21:? #6;"select level
   :1"
PT 25250 POSITION 4,22:? #6;"PRESS start"
UK 25255 LV=1
EV 25260 SETCOLOR 1,4,4
IK 25280 GOSUB 25340:SETCOLOR 1,0,15:GOSU
   B 25340:GOTO 25260
FZ 25290 LVL=LV-1:RETURN
VS 25300 FOR DLAY=1 TO 7:SOUND 0,100-DLAY
   ,8,10:NEXT DLAY:SOUND 0,0,0,0:RETURN
AP 25310 POSITION 13,16:? #6;" "
IG 25320 L=L+1:? #6;NAME$(L,L):RETURN
UY 25340 FOR ZZ=1 TO 50:IF PEEK(53279)=6
   THEN POP :POP :GOTO 25290
JI 25350 IF PEEK(53279)=5 THEN FOR I=1 TO
    15:NEXT I:LV=LV+1:POSITION 16,21:? #6
   ;LV;" ":IF LV>19 THEN LV=0
YP 25360 NEXT ZZ:RETURN
```

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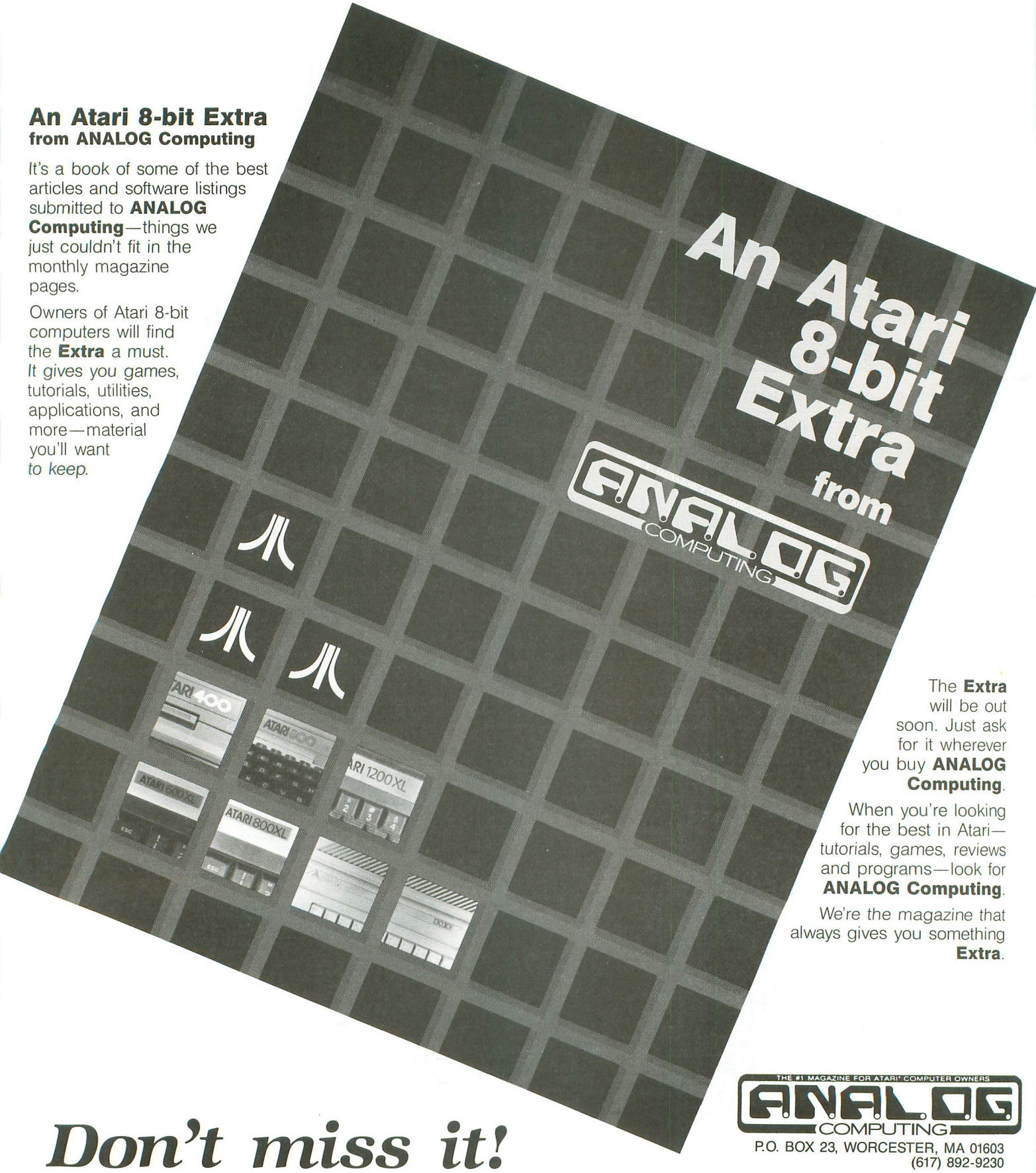

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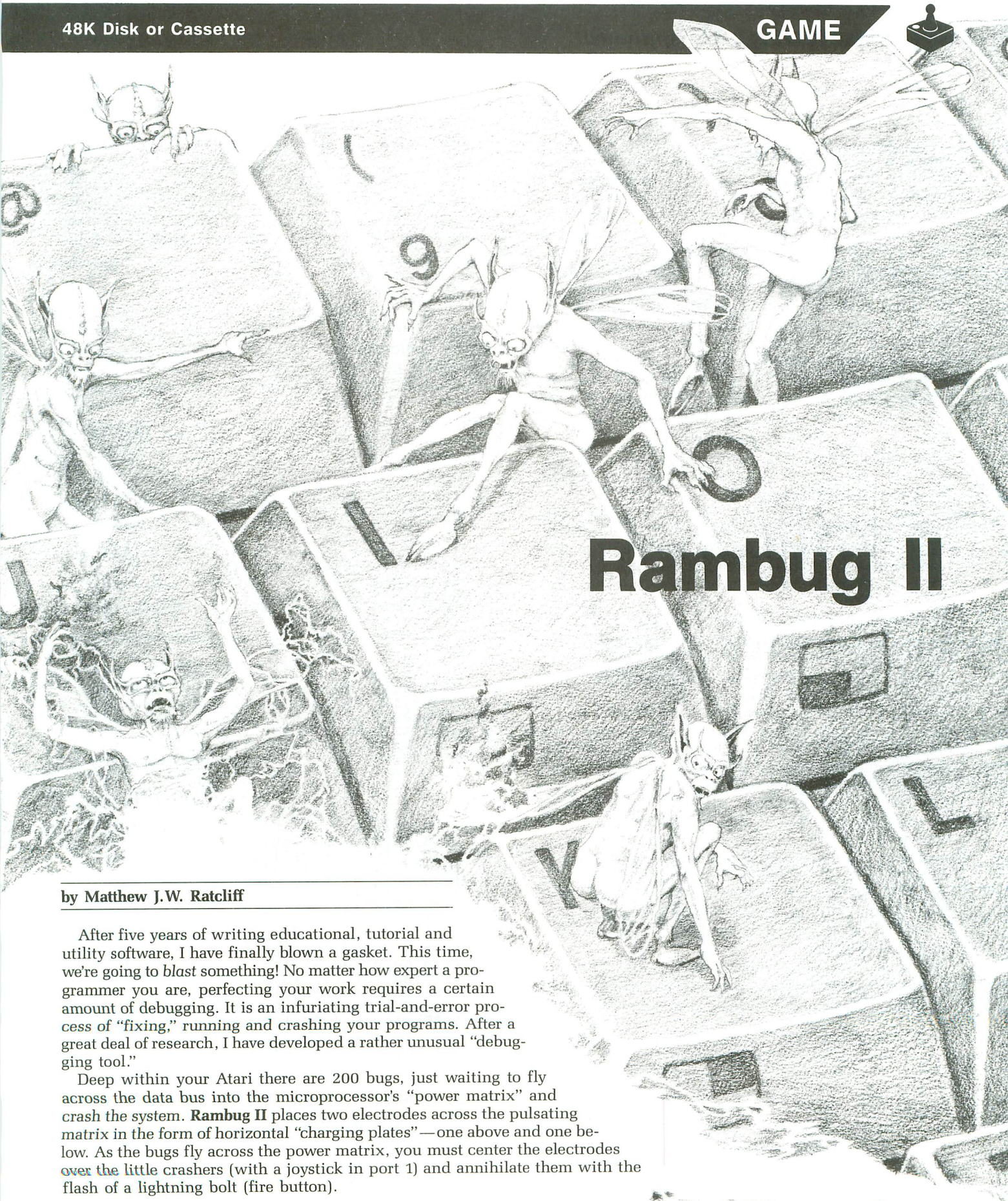

Rambug II

by Matthew J.W. Ratcliff

After five years of writing educational, tutorial and utility software, I have finally blown a gasket. This time, we're going to *blast* something! No matter how expert a programmer you are, perfecting your work requires a certain amount of debugging. It is an infuriating trial-and-error process of "fixing," running and crashing your programs. After a great deal of research, I have developed a rather unusual "debugging tool."

Deep within your Atari there are 200 bugs, just waiting to fly across the data bus into the microprocessor's "power matrix" and crash the system. **Rambug II** places two electrodes across the pulsating matrix in the form of horizontal "charging plates"—one above and one below. As the bugs fly across the power matrix, you must center the electrodes over the little crashers (with a joystick in port 1) and annihilate them with the flash of a lightning bolt (fire button).

Rambug II *continued*

Your electrodes draw their power from the matrix—a limited supply—beginning each game with 2000 watts of energy. There are twenty rounds of ten bugs each to complete the game. (Yes, it's possible to finish.) Use your powerful lightning bolt sparingly to make it to the end. Your electrodes are fragile, like the filament of a light bulb. Should a bug hit one when it's not energized, the electrodes will short out and disintegrate.

Fortunately, you have five of these "debuggers." If a bug approaches an electrode from the side, protect yourself by pressing the fire button just before it gets there. You can also blast several bugs at a time as they cross paths within your field of fire. If a bug successfully crosses the power matrix, he makes his way into your CPU and destroys one of your spare electrodes. If all your electrodes are destroyed, or you run out of power, then the bug's "crash run" was successful, and the game ends.

Set-up and play.

Listing 1 is the BASIC data used to create your copy of **Rambug II**. Please refer to the **M/L Editor** on page 19 for typing instructions.

When run, **Rambug II** first checks for a file called D:RAMBHI. If found, it loads the all-time high score data and displays it on the title screen. Press START to continue. At the second screen, press SELECT for one of three difficulty levels. This adjusts the width of your electrodes and lightning bolt. The bugs at higher difficulty levels fly faster and are worth more points when zapped. The ultimate goal of **Rambug II** is to obliterate all 200 bugs in your computer, with power to spare—no small task.

While playing the game, your POWER and BUG counts are updated frequently. Your "debugger" count (remaining electrodes) is displayed in place of SCORE during game play. Each ROUND number is displayed, along with the current power rating, such as MILLIwatts or MEGAwatts. Dead bugs fill the power matrix as you blast away.

Pressing START will end the game early, thus admitting your defeat by the bugs. The SPACE BAR may be pressed to pause and to continue the game. Bonuses are awarded for rounds where all ten bugs are converted to nuclear dust. Your final score is based on surplus matrix power, bonuses, difficulty level and total bugs wasted. If you last long enough, at the end of the twentieth round you've *finished* the game and foiled the bugs' crash attempts. The final score and overall high score are computed and displayed.

If you get a new all-time high score, you will be prompted to enter your name for the record books. Your new high score, bug count, surplus power and name are then written to disk. At the end of the game, you're usually returned to the "Select" screen. If it was a high-scoring game, the original title screen is displayed for all to see who the new Master Bug Blaster is. The next time **Rambug II** is booted, this score will be loaded and displayed again.

If any disk I/O error occurs during a read or write, the file is closed, and the high score data is zeroed out in memory. This will be the case the first time you play the game, since D:RAMBHI won't be there. The file will be created after your first game. Now, when you blast 200 bugs, with 500 watts to spare, you will have proof positive—and a goal for others to meet or beat.

Revenge is sweet.

The next time you're burning the midnight oil, trying to work out that final nasty bug in a program, fire up **Rambug II** and take revenge on those little beasties! It just may relieve some of the frustration that goes with a real debugging task. If you don't program, nuking bugs can be great fun anyway. Should you not blast all the bugs, that's okay. There are always more to squash with **Rambug II**.

I would like to thank Dave Miller, SYSOP of M.I.C.E. BBS (314-355-3403) in St. Louis, for his assistance with the graphics, sound effects and playability development of this game. The power ratings go up in each round of the game. Not all are valid prefixes; can you find them? These "bogus" wattage levels in **Rambug II** are the names of several well known St. Louis area SYSOPS, but you have to be a great "debugger" to see them.

Listing 1.

```
1000 DATA 255,255,0,80,80,80,112,112,7
0,21,80,7,7,128,7,7,8549
1010 DATA 7,7,7,7,7,7,7,7,65,0,80,115,
99,111,114,101,274
1020 DATA 0,16,16,16,16,16,0,232,233,0
,16,16,16,16,16,176,9149
1030 DATA 175,183,178,26,0,0,153,153,1
53,0,97,116,116,111,119,97,4739
1040 DATA 116,116,115,226,245,231,243,
26,0,0,144,144,144,0,50,47,3843
1050 DATA 53,46,36,26,0,144,145,25,81,
215,97,0,0,0,0,0,7432
1060 DATA 178,161,173,162,181,167,128,
128,169,169,0,0,0,0,0,0,9765
1070 DATA 0,0,114,97,116,0,97,110,100,
0,109,105,108,108,101,114,3553
1080 DATA 0,0,0,0,99,104,105,101,102,0
,101,120,116,101,114,109,3587
1090 DATA 105,110,97,116,111,114,115,0
,51,37,44,37,35,52,0,100,8754
1100 DATA 105,102,102,105,99,117,108,1
16,121,0,0,0,0,0,0,243,9993
1110 DATA 244,225,242,244,0,111,114,0,
230,233,242,229,0,0,0,0,4780
1120 DATA 0,0,34,37,39,41,46,0,36,37,3
4,53,39,39,41,46,6241
1130 DATA 39,0,0,119,114,105,116,105,1
10,103,0,238,229,247,0,40,6448
1140 DATA 41,0,179,163,175,178,165,0,9
7,116,116,111,102,101,109,116,6340
1150 DATA 111,0,112,105,99,111,0,110,9
7,110,111,109,105,99,114,111,4797
1160 DATA 109,105,108,108,105,99,101,1
10,116,105,0,100,101,99,105,112,4301
1170 DATA 108,97,110,111,0,100,101,107
,97,104,101,99,116,111,0,107,3395
1180 DATA 105,108,111,0,109,101,103,97
,0,103,105,103,97,0,116,101,2520
1190 DATA 114,97,100,97,110,110,111,10
6,105,109,98,111,110,97,102,105,5464
1200 DATA 101,100,97,118,105,101,109,9
7,116,116,111,114,97,116,116,111,6128
1210 DATA 78,174,206,238,66,132,52,196
,70,6,198,134,65,1,193,129,6554
1220 DATA 0,81,74,42,44,127,60,0,128,2
24,113,58,7,248,112,8,3876
1230 DATA 0,0,16,121,198,251,112,16,1,
6,206,172,48,28,38,65,2195
1240 DATA 0,0,198,175,48,28,39,16,0,0,
0,0,0,162,181,173,1094
1250 DATA 162,172,165,128,166,169,174,
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167,165,178,179,0,0,0,0,0,2395
1260 DATA 176,178,175,128,165,184,180,
165,178,173,169,174,161,180,175,178,47
03
1270 DATA 0,0,0,173,161,179,180,165,17
8,128,162,181,167,128,162,172,2402
1280 DATA 161,179,180,165,178,0,1,14,1
28,8,6,14,136,8,12,13,7742
1290 DATA 137,9,18,13,149,9,24,13,148,
10,30,12,144,10,36,12,7272
1300 DATA 164,10,42,11,168,11,48,11,16
4,11,54,11,175,11,60,10,8785
1310 DATA 166,12,66,10,164,12,72,10,18
2,13,78,9,174,13,84,9,9796
1320 DATA 173,13,90,8,176,14,96,8,190,
14,102,8,185,14,108,7,922
1330 DATA 194,15,114,7,186,15,120,7,19
1,16,0,0,0,0,112,112,9191
1340 DATA 71,248,82,0,7,0,7,0,7,0,2,11
2,7,0,7,0,3862
1350 DATA 7,0,7,0,7,112,2,65,220,82,0,
0,0,0,33,14,6138
1360 DATA 46,14,33,14,44,14,47,14,39,1
4,0,0,0,0,0,0,2825
1370 DATA 0,0,0,99,111,109,112,117,116
,105,110,103,0,0,0,0,9235
1380 DATA 0,0,0,0,0,0,0,0,240,242,229,
243,229,238,244,243,5252
1390 DATA 0,0,0,0,0,0,0,0,0,0,0,242,22
5,237,226,245,7847
1400 DATA 231,128,128,233,233,0,0,0,0,
0,34,121,0,45,97,8576
1410 DATA 116,10,50,97,116,0,13,0,119,
105,116,104,0,36,97,118,1247
1420 DATA 101,0,45,14,41,14,35,14,37,1
4,0,45,105,108,108,101,9484
1430 DATA 114,0,116,104,101,0,98,101,1
15,116,0,98,117,103,0,107,2353
1440 DATA 105,108,108,101,114,0,0,0,0,
0,0,0,0,0,0,0,3059
1450 DATA 0,0,0,0,0,0,0,0,0,0,0,40,41,39
,40,37,51,4820
1460 DATA 52,0,51,35,47,50,37,26,0,0,0
,0,0,0,98,117,6149
1470 DATA 103,115,0,98,108,97,115,116,
101,100,0,26,0,0,0,0,0,7271
1480 DATA 0,0,51,53,50,48,44,53,51,0,4
8,47,55,37,50,26,7065
1490 DATA 0,0,0,0,0,0,0,0,0,0,0,48,114,1
01,115,115,0,8034
1500 DATA 59,51,52,33,50,52,61,0,116,1
11,0,46,53,43,37,0,7490
1510 DATA 115,111,109,101,0,98,117,103
,115,1,0,0,0,0,68,58,7802
1520 DATA 82,65,77,66,72,73,0,169,4,32
,157,84,16,17,169,0,449
1530 DATA 141,120,95,141,121,95,133,20
4,133,200,133,201,76,168,85,32,8697
1540 DATA 201,84,48,234,141,120,95,32,
201,84,48,226,141,121,95,32,6688
1550 DATA 201,84,48,218,133,200,32,201
,84,48,211,133,201,32,201,84,9205
1560 DATA 48,204,133,204,169,7,32,129,
84,76,168,85,169,8,32,157,5059
1570 DATA 84,16,3,76,168,85,172,120,95
,32,196,84,48,245,172,121,8422
1580 DATA 95,32,196,84,48,237,164,200,
32,196,84,48,230,164,201,32,9634
1590 DATA 196,84,48,223,164,204,32,196
,84,48,216,169,11,32,129,84,6336
1600 DATA 76,168,85,162,16,157,66,3,16
9,0,157,73,3,169,20,157,3764
1610 DATA 72,3,169,132,157,68,3,169,83
,157,69,3,76,86,228,72,5165
1620 DATA 32,168,85,104,157,74,3,169,0
,157,75,3,157,73,3,169,3504
1630 DATA 252,157,68,3,169,83,157,69,3
,169,8,157,72,3,169,3,2656
1640 DATA 157,66,3,76,86,228,169,11,76
,203,84,169,7,162,16,157,6088
1650 DATA 66,3,169,0,157,72,3,157,73,3
,152,76,86,228,169,18,5127
1660 DATA 32,101,86,169,2,133,248,169,
4,141,198,2,169,132,141,196,9668
1670 DATA 2,169,220,160,82,166,20,228,
20,240,252,141,48,2,140,49,7260
1680 DATA 2,169,248,133,88,169,82,133,
89,169,0,133,241,32,5,84,5475
1690 DATA 169,166,133,196,169,83,133,1
97,173,120,95,174,121,95,32,120,8417
1700 DATA 90,169,186,133,196,169,83,13
3,197,165,204,162,0,32,120,90,8156
1710 DATA 169,206,133,196,169,83,133,1
97,165,200,166,201,32,120,90,162,1085
1720 DATA 15,173,11,212,201,38,208,249
,189,178,85,141,10,212,141,25,9364
1730 DATA 208,202,16,244,173,196,2,141
,25,208,162,15,173,193,85,72,8194
1740 DATA 160,14,185,178,85,157,178,85
,202,136,16,246,104,141,178,85,150
1750 DATA 160,16,162,255,173,31,208,20
1,7,208,9,202,208,246,136,208,3745
1760 DATA 243,76,61,85,169,132,133,192
,169,82,133,193,32,57,91,160,8041
1770 DATA 0,177,192,208,247,162,255,17
3,31,208,201,7,208,230,202,208,5844
1780 DATA 246,169,0,133,204,133,200,13
3,201,96,162,16,169,12,157,66,7697
1790 DATA 3,76,86,228,10,26,42,58,74,9
0,106,122,138,154,170,186,7751
1800 DATA 202,218,234,250,169,18,32,10
1,86,162,3,189,18,82,157,196,7693
1810 DATA 2,202,16,247,169,0,160,80,16
6,20,228,20,240,252,141,48,9830
1820 DATA 2,140,49,2,169,170,141,0,2,1
69,91,141,1,2,169,192,5158
1830 DATA 141,14,212,169,21,133,88,169
,80,133,89,173,100,86,208,12,7103
1840 DATA 173,36,2,141,99,86,173,37,2,
141,100,86,169,192,141,36,6309
1850 DATA 2,169,91,141,37,2,32,217,86,
162,0,134,196,134,198,162,9172
1860 DATA 64,134,199,174,244,2,134,197
,162,2,160,0,177,196,145,198,857
1870 DATA 200,208,249,230,197,230,199,
202,208,242,162,0,189,30,82,157,2220
1880 DATA 8,64,232,224,40,208,245,169,
64,141,244,2,162,7,173,10,7776
1890 DATA 210,41,60,157,48,64,202,16,2
45,169,216,133,192,169,82,133,1243
1900 DATA 193,96,83,58,0,0,0,72,162,96
,169,12,157,66,3,32,1285
1910 DATA 86,228,162,96,169,3,157,66,3
,169,96,157,68,3,169,86,5306
1920 DATA 157,69,3,104,157,75,3,41,240
,73,16,9,12,157,74,3,910
1930 DATA 32,86,228,96,166,242,169,165
,133,196,169,81,133,197,202,240,5332
1940 DATA 14,24,169,5,101,196,133,196,
144,2,230,197,202,16,242,162,1991
1950 DATA 5,160,0,177,196,153,51,80,20
0,202,208,247,165,242,160,0,2883
1960 DATA 56,233,10,144,4,200,76,190,8
6,105,10,72,152,24,105,144,5349
1970 DATA 141,79,80,104,24,105,144,141
,80,80,96,162,0,160,0,185,5531
1980 DATA 22,82,157,81,80,200,192,4,20
8,2,160,0,232,224,200,208,2069
1990 DATA 238,96,162,0,169,0,157,81,80
,232,224,200,208,248,96,173,3786
2000 DATA 10,210,41,7,170,173,10,210,4
1,24,157,48,64,96,165,244,7686
2010 DATA 162,0,157,4,208,24,105,2,232
,224,4,208,245,96,165,249,2450
2020 DATA 240,3,198,249,96,169,48,141,
66,67,160,0,24,174,10,210,6096
2030 DATA 48,4,42,42,144,4,106,106,176
,248,133,250,25,65,67,153,7929
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2040 DATA 66,67,200,192,157,240,10,165
,250,153,66,67,200,192,157,208,3504
2050 DATA 220,169,196,141,5,210,173,10
,210,9,192,141,4,210,169,2,7679
2060 DATA 133,249,96,169,0,160,0,153,6
6,67,200,192,157,208,248,141,2536
2070 DATA 5,210,141,4,210,96,206,41,88
,198,205,32,59,88,32,114,6044
2080 DATA 94,169,0,174,213,97,149,222,
157,0,208,173,21,87,141,241,913
2090 DATA 87,169,10,141,21,87,165,244,
141,242,87,162,156,173,10,210,1393
2100 DATA 157,66,67,141,10,212,142,243
,87,173,10,210,41,15,133,244,9199
2110 DATA 173,242,87,56,229,244,133,24
4,32,12,87,174,243,87,206,21,0
2120 DATA 87,208,5,169,10,141,21,87,20
2,208,210,161,192,208,204,174,4445
2130 DATA 243,87,140,243,87,32,97,87,1
72,243,87,173,241,87,141,21,9754
2140 DATA 87,173,242,87,133,244,32,12,
87,173,212,97,174,213,97,141,1060
2150 DATA 30,208,96,0,0,0,169,17,160,8
8,76,255,87,169,29,160,6911
2160 DATA 88,133,196,132,197,160,0,162
,12,177,196,153,21,80,200,202,366
2170 DATA 208,247,96,115,99,111,114,10
1,0,0,0,0,0,0,0,100,7987
2180 DATA 101,98,117,103,103,101,114,1
15,0,0,0,0,16,17,18,19,7099
2190 DATA 20,21,22,174,41,88,189,42,88
,141,31,80,96,169,7,141,4884
2200 DATA 144,88,169,255,141,252,2,160
,0,132,195,169,170,141,5,210,670
2210 DATA 141,7,210,185,146,88,141,145
,88,200,185,146,88,200,141,4,9842
2220 DATA 210,56,233,2,141,6,210,162,2
55,202,208,253,206,145,88,208,5751
2230 DATA 248,169,0,141,4,210,141,5,21
0,141,6,210,141,7,210,169,9358
2240 DATA 37,141,145,88,202,208,253,20
6,145,88,208,248,206,144,88,208,5814
2250 DATA 186,96,0,0,40,255,70,255,70,
253,170,255,150,217,100,255,5546
2260 DATA 200,191,161,162,163,164,165,
166,167,168,169,170,171,172,173,174,53
47
2270 DATA 175,176,177,178,179,180,181,
182,183,184,185,186,255,254,0,63,4371
2280 DATA 21,18,58,42,56,61,57,13,1,5,
0,37,35,8,10,47,5800
2290 DATA 40,62,45,11,16,46,22,43,23,1
2,52,33,110,101,119,0,9411
2300 DATA 104,105,13,229,238,244,229,2
42,128,238,225,237,229,142,0,0,3578
2310 DATA 32,59,88,32,114,94,32,240,86
,169,0,133,241,133,195,169,814
2320 DATA 218,160,88,162,2,32,91,93,16
2,19,169,0,157,132,83,202,7226
2330 DATA 16,250,169,141,133,196,169,8
0,133,197,169,0,133,198,173,24,87
2340 DATA 82,160,0,145,196,173,252,2,2
01,255,240,249,141,161,89,32,3041
2350 DATA 162,89,162,28,169,255,141,25
2,2,173,161,89,160,0,221,189,1672
2360 DATA 88,240,6,202,16,248,76,35,89
,189,160,88,201,255,240,23,1792
2370 DATA 201,254,240,19,145,196,230,1
96,208,2,230,197,230,198,165,198,7145
2380 DATA 201,20,208,186,76,139,89,201
,255,208,7,169,0,145,196,76,100
2390 DATA 139,89,201,254,208,175,165,1
98,240,164,198,198,169,0,145,196,5017
2400 DATA 198,196,165,196,201,255,208,
2,198,197,76,28,89,162,19,189,9934
2410 DATA 141,80,157,132,83,202,16,247
,169,255,141,102,88,169,37,141,592
2420 DATA 126,88,96,0,169,60,141,6,210
,169,64,141,4,210,169,170,9473
2430 DATA 141,5,210,141,7,210,162,255,
160,47,202,208,253,136,208,250,7185
2440 DATA 169,0,141,6,210,141,4,210,14
1,7,210,141,5,210,96,169,9150
2450 DATA 46,133,196,169,80,133,197,16
5,200,166,201,32,120,90,169,66,389
2460 DATA 133,196,169,80,133,197,165,2
04,162,0,32,120,90,96,142,118,8228
2470 DATA 90,140,119,90,169,0,141,14,9
0,169,68,141,15,90,224,0,5256
2480 DATA 240,9,238,15,90,202,208,250,
174,118,90,160,255,169,0,153,2415
2490 DATA 0,68,136,16,250,173,10,210,1
06,106,41,128,149,214,173,10,8825
2500 DATA 210,41,15,208,2,169,1,149,20
6,21,214,149,214,41,128,208,702
2510 DATA 4,169,37,208,2,169,207,149,2
22,173,10,210,106,106,41,128,9343
2520 DATA 149,218,173,10,210,41,15,149
,210,21,218,149,218,173,10,210,1309
2530 DATA 201,67,176,4,169,67,208,6,20
1,209,144,2,169,209,149,226,2641
2540 DATA 169,21,24,229,242,10,10,10,1
0,149,237,173,10,210,41,31,5603
2550 DATA 21,237,149,237,172,119,90,96
,0,0,141,221,90,142,222,90,9543
2560 DATA 160,0,140,223,90,162,0,173,2
21,90,56,249,213,90,141,221,3011
2570 DATA 90,173,222,90,200,249,213,90
,144,8,141,222,90,232,136,76,2002
2580 DATA 133,90,136,173,221,90,121,21
3,90,141,221,90,138,240,3,238,2927
2590 DATA 223,90,174,223,90,208,4,169,
0,240,2,9,144,162,0,129,6219
2600 DATA 196,230,196,208,2,230,197,20
0,200,192,8,144,184,173,221,90,4150
2610 DATA 9,144,162,0,129,196,96,16,39
,232,3,100,0,10,0,0,58
2620 DATA 0,0,169,3,141,29,208,169,33,
141,111,2,169,62,141,47,5710
2630 DATA 2,162,3,189,14,82,157,192,2,
202,16,247,162,3,169,0,6779
2640 DATA 157,8,208,202,16,250,169,64,
141,7,212,169,0,168,153,0,7866
2650 DATA 67,153,0,68,153,0,69,153,0,7
0,153,0,71,200,208,238,8801
2660 DATA 169,114,133,244,32,12,87,169
,255,141,64,67,141,65,67,141,7842
2670 DATA 224,67,141,223,67,169,0,141,
12,208,96,164,248,240,3,198,1829
2680 DATA 248,96,177,192,240,35,141,0,
210,32,118,91,177,192,141,1,8536
2690 DATA 210,32,118,91,177,192,141,2,
210,32,118,91,177,192,141,3,8474
2700 DATA 210,32,118,91,169,2,133,248,
96,169,0,141,0,210,141,1,6781
2710 DATA 210,141,2,210,141,3,210,96,2
30,192,208,2,230,193,96,169,3147
2720 DATA 6,133,252,165,242,41,3,168,1
85,26,82,141,168,91,164,251,1682
2730 DATA 169,200,56,233,20,136,208,25
0,164,242,136,140,169,91,24,109,1418
2740 DATA 169,91,168,173,168,91,153,81
,80,96,0,0,72,138,72,162,5612
2750 DATA 3,189,196,2,41,240,9,2,157,2
2,208,202,16,243,104,170,9686
2760 DATA 104,64,133,245,134,246,132,2
47,8,165,241,208,13,162,3,169,1472
2770 DATA 0,157,0,208,202,16,250,76,24
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2780 DATA 214,237,202,16,247,165,252,2
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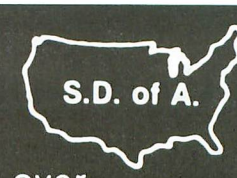

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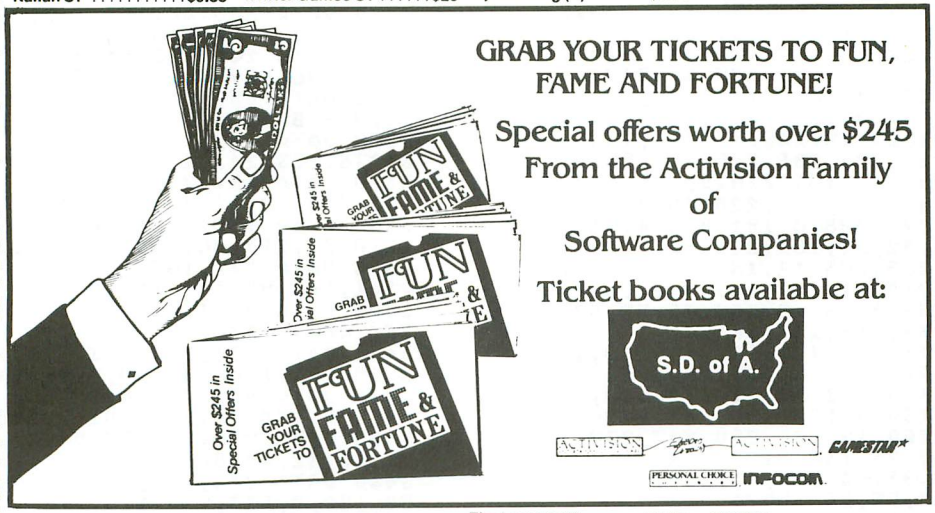

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by Matthew J.W. Ratcliff

Atari put an unusual "parallel bus" connector on the back of its 800XL and 600XL computers a few years ago. The parallel bus on the XL and 130XE machines was designed to connect to external high-speed devices, similar to the DMA port on the ST. Software and some additional bank-switching technology were also added to accommodate these *future* products that never came from Atari. ICD, Inc., however, decided to build the ultimate multifunction board for the 8-bit Ataris, giving this machine all the features you could hope for.

First and foremost is the RAM contained in the **MIO**. I opted for the 1-meg version to test. One megabyte of RAM is 1024K, or about 5.7 double-density floppy disk drives. The default configuration of the **MIO** yields over 3000 double-density sectors of RAMdisk space, among many other features.

The **MIO** gives you a printer interface, a standard P: device. It takes the same cable the 850 or P:R: interfaces do. A 63K printer buffer is part of the **MIO** default setup. This may be reconfigured in increments of 32K, from 0 to 1023K. (The "missing" 1K is working RAM used by the **MIO** software itself, so it does not cost you any of the computer's main RAM.)

I tested the printer interface with **The Print Shop**. I printed a sign, with a 64K printer buffer enabled. About one-third of the way through the printout, control was returned to **The Print Shop** menu, while the spooler continued to churn out the picture. I then pressed RESET while holding the SELECT key, to get to the **MIO** control menu. I found that 44K of printer buffer space had been used by the graphic. I selected the second option, printer configuration, and then pressed *R* for repeat copies. The **MIO** immediately began dumping the graphic again, with no problems. When you exit **The Print Shop** to the **MIO** menu, you cannot return. While *in the middle* of a graphic, I turned off the computer and rebooted from an **MIO** RAMdisk, and began work on something else. While the computer was off, the **MIO** ceased printing. As soon as I powered up again, the **MIO** continued to crank out my graphics, *exactly* where it left off, without dropping a single dot.

You will find that, when exiting from the **MIO** menu, it is equivalent to a cold-start with most software. I found I could go to the **MIO** menu from BASIC, change some parameters and return to BASIC—with my program listing still in memory. The same *was not* true for MAC/65, BASIC XL, **AtariWriter**, or the Atari Assembler Editor. Apparently, only the XL and XE internal BASIC ROMs are safe from the **MIO** menu, while *all* external cartridges and disk software are not.

You also have the RS232 port, simply R1:, on the **MIO**. It is equivalent to the R1: port on the 850 or P:R: interfaces. It *looks* just like the old faithful R1: to your Atari. I've tested it at 1200 baud on Delphi, doing some extremely fast file transfers to and from RAMdisk, using the Keith Ledbetter **850 Express**, version 3.0. I have also tested it with **Amodem Plus 6.2**, and again it ran flawlessly, with no modifications required. One of the configuration features of the **MIO** is to redirect printer output (P:) to the RS232 port, for printers with that type of interface.

If you want even more, another connector is provided for attaching up to eight 16-megabyte hard disk drives. Larger hard drives (20-, 40-, even 60-meg) can be partitioned into smaller logical hard drives. **SpartaDOS** provides a great deal of flexibility in setting up your hard drive. The complete technical documentation even provides information for setting up the hard drive and **MIO** using MYDOS for those who prefer it over **SpartaDOS**.

One problem I ran into when testing other DOSs with the **MIO**, is that the RAMdisks are *always* double density. You have no choice in the matter. If you boot a single-density DOS 2.0S disk and format one of the **MIO** RAMdisks, it will show 707 sectors, as expected. But they will be double-density, 256-byte sectors. This will cause problems if you try to duplicate from **MIO** RAMdisks to floppy, or vice versa. Copying a file at a time seems to cause no problems, however. I did find that ICD's SCOPY utility (recently updated to support copying DOSs other than **SpartaDOS**) would copy from a single-density floppy to a compacted file on an **MIO** RAMdisk. From there I was able to SCOPY from the compacted file back to another floppy, resulting in a mirror copy of the original. It seems that you will need to use **SpartaDOS** to get the *most* out of the **MIO**, although I have found other DOSs (2.0, 2.5 and OSS DOS XL) work fine with it. If you plan to use the RAM drives and printer spooler (without adding a hard drive), just about any DOS will suit your needs.

One of the nicest features of the **MIO** is its capability to redirect all I/O. For example, if I boot off the floppy drive, D1: and copy the entire DOS system disk to RAMdisk D8:, I can then *swap* them. The phys-

ical floppy disk becomes D8:, and the RAMdisk becomes D1:. (No switch settings need be changed; the **MIO** handler takes care of all the redirection automatically.) What this means is that you can now turn off your computer, and then reboot almost instantly off the **MIO** RAMdisk. RAMdisks in the **MIO** are far more reliable than any internal RAMdisk you may run in your computer. If your computer locks up and you have valuable information stored on RAMdisk inside your Atari, it is *gone* forever. You can totally crash your computer, instantly reboot from the **MIO**, and recover all your files!

If you hook up a SASI or SCSI interface hard drive, your **MIO** configuration may be saved to the hard disk. Then, whenever you power up, you will quickly boot off the hard drive, with your old configuration automatically restored. One of my few complaints about the **MIO** is that this configuration cannot be saved to a floppy disk, nor can it be set from a **SpartaDOS** start-up batch file. The setup procedure is simple to access and perform, but it would be nice if it could be done automatically from floppy disk, as well. If you leave it plugged in all the time, as I do (with appropriate surge protection, of course), then it won't be an annoyance at all.

You can set a write lock for RAMdisks and hard drives from this menu, similar to placing a write protect tab on a floppy. An 80-column adaptor board and networking capabilities are planned for the **MIO** in the future.

For those of you who are curious about "battery backup" for the **MIO** board, this unit requires about 2 watts of continuous power. The **MIO** uses a standard Atari 9-volt AC supply, like that used with Atari disk drives. A battery backup unit would not be easy to build, nor cheap.

Owners of the 130XE will need the bus adaptor board for connection to the **MIO**. This adaptor also gives you two vertical cartridge slots. Your RTIME8 cartridge can go in the rear slot, and your programming cartridge in front. The only problem with this adaptor is that it does not have the "fins" you find atop the RTIME cartridge, or inside all Atari computers. This means that you'll have to retract the spring-loaded doors of some Atari cartridges (the Atari games, **AtariWriter**, and so on), by inserting a paper clip at one edge and sliding it back. This can be a real pain. I've started removing the spring and door insert with beveled edges (but not the sliding piece) from my cartridges. I also found that some game cartridges would not run with the **MIO** connected (**Caverns of Mars** from Atari and **Atalantis** from Imagic).

The **MIO** turns your 8-bit into the ultimate software development system, if you want fast compiles with many "include" libraries. It can be an impressive RAM-driven bulletin board system and, with a hard drive, it can become a *fantastic BBS* system. Should you opt for the **MIO** network (when it is completed) and eight personal phone lines, you can have the best 8-bit BBS system ever built.

ICD has developed a reputation for first-quality hardware and utility software for the Atari computers. The **MIO** not only lives up to that reputation, it improves on it. If you want the most computing power and interfacing flexibility possible for your faithful 8-bit Atari, the **MIO** board is the only choice.

The Vertical Blank Interrupt SCROLLING

by Allan E. Moose and Marian J. Lorenz

In our previous article (issue 51), we discussed the basic concepts fundamental to using machine language routines during the TV vertical blank (VB). There are two times when this is an especially useful programming technique. One is when you want to do scrolling. The other is when you want to play music with a concurrently running program. In this article, we'll talk about horizontal and vertical scrolling. Our next article will demonstrate the addition of music to a scrolling routine.

All home computers offer some type of scrolling capability. We're all familiar with the vertical scrolling of text up a screen as a program is listed. Many word-processing programs use both horizontal and vertical scrolling. The Atari computers offer the most refined scrolling capabilities of any small computer system. A programmer can do coarse and fine scrolling in both directions, one at a time or simultaneously, to produce diagonal movement with relative ease.

The games **Eastern Front** and **Caverns of Mars** are the best examples of what can be accomplished with the Atari's scrolling. The reason that these programs haven't been translated to other computers is that no other computer can duplicate the Atari's scrolling capability. This is largely due to the manner in which screen memory is handled. Other systems use static blocks of screen memory, whereas the Atari can use any available section of RAM for screen memory.

The Atari system approaches scrolling in a different manner from systems having static screen memory. In those systems, data must be moved through the screen memory area. The Atari, on the other hand, keeps the data static and moves the screen across memory, consequently achieving a smoother flowing scroll with less programming effort. To get a better idea of the process, take a 3x5 card and cut out a window:

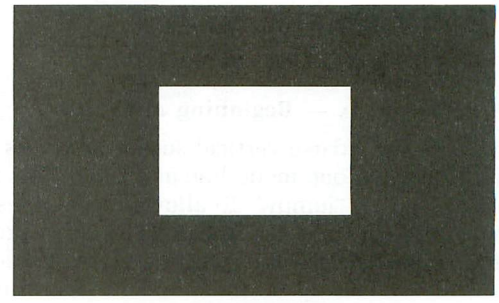

Figure 1. — Your scrolling prop.

To see the scrolling up function at work, move the card *down* over the text in this article. For scrolling down, move the card *up* over the text. To see horizontal scrolling, move the card to the left or right over the text. This simple exercise is helpful in understanding the programs that come later.

Scrolling can be useful in several ways. For example, it can be used if you need to display more information than the screen can hold, such as when displaying detailed maps or blueprints. It can also enhance animation by allowing moving players to travel over a moving background.

Vertical scrolling.

Vertical scrolling is controlled by the LMS instruction in a display list. Normally, this instruction contains the address of the beginning of screen memory. *Coarse vertical scrolling* is as simple as changing the address portion of the LMS instruction by an amount equal to the number of bytes displayed in one mode line on the TV screen.

The idea can be illustrated as follows. Suppose we are working in graphics 2, where there are 20 bytes of mem-

ory per mode line and screen memory starts at page 154,0. (In case you've forgotten, each graphics mode line is built up of 1 to 16 TV scan lines, depending on the graphics mode.) Figures 2a and 2b show what happens to your screen when the LMS bytes are changed to 154,20.

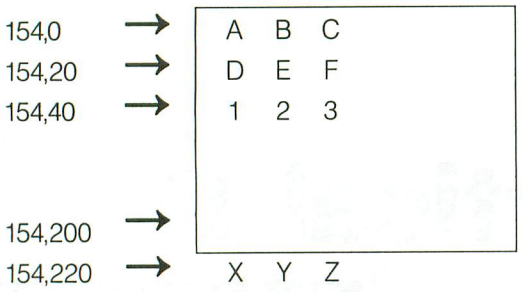

Figure 2a. — Beginning at 154,0.

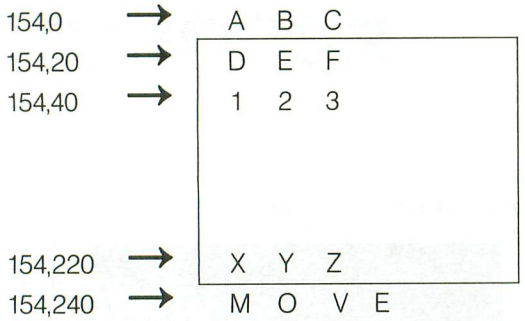

Figure 2b. — Beginning at 154,20.

As you can see, coarse vertical scrolling moves information up or down one mode line at a time. This movement appears to be "jumpy." To alleviate jumpiness, the Atari hardware (in this case, the ANTIC chip) provides an option called *fine scrolling*. In fine vertical scrolling, the mode line moves up or down one TV scan line at a time.

Implementing fine vertical scrolling requires an adjustment to ANTIC's display list and manipulation of a hardware register. Recall that the display list is a program for ANTIC to follow when creating the TV display. Basically, the display list consists of a sequence of mode line instructions followed by a *Jump during Vertical Blank* (JVB) instruction. Each of the standard mode line instructions can be augmented by setting certain bits that will either cause an LMS, a *Display List Interrupt* (DLI), horizontal fine scrolling, or vertical fine scrolling. Figure 3 is the format of a display list byte:

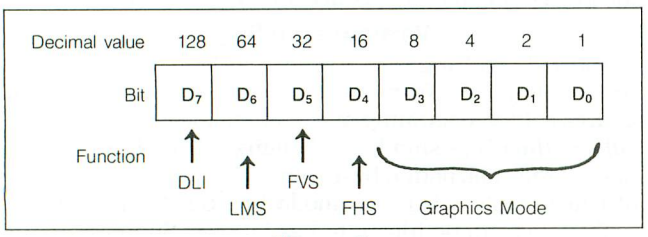

Figure 3.

From this, we see that to prepare for fine scrolling a 32 (decimal) must be added to each of the mode line instructions in the display list. This applies to all of the mode line instructions except the blank lines at the top of the screen. When ANTIC encounters a mode line instruction with bit D_5 set, the display hardware must know how many scan lines to scroll that mode line. That information must be provided by the programmer, by storing a number from *0* to *15* in the hardware register VSCROL at 54277. (Only the lower 4 bits of the register are used.) The essential task of a fine-scrolling subroutine is to increment VSCROL until it reaches *15*, then do a coarse scroll by changing the LMS address, and reset VSCROL to *0*. This process is repeated for as long as vertical scrolling is desired.

The UP! UP! and AWAY! (Listing 1) program illustrates these ideas by scrolling a hot air balloon up the screen. The machine language routine is added to the VB processing by using system timer 2 at location 538, 539. When system timer 2 counts down to *0*, the operating system (or OS) does a JSR to the memory location specified in 552 (lo-byte) and 553 (hi-byte). Routines that use system timer 2 do not have to be installed with SETVB and must end with an RTS. To start a program that uses system timer 2, you must read your program into memory, put its starting address at 552 and 553, and then POKE a value other than *0* into 538.

Explanation of the vertical scrolling program.

There are three basic tasks the machine language fine-scrolling program must perform: (1) keep track of how far the balloon has scrolled, (2) carry out fine and/or coarse scrolling, and (3) reset system timer 2 (CDTMV2) so the program is repeated each sixth vertical blank.

The program (see Table 1) can be broken into three sections. Section 1 limits the distance that the balloon scrolls up the screen, by counting the number of times the subroutine has been called. It does this by incrementing the value in a register called COUNT, until COUNT has reached *120*. There's no magic in the number *120*. It's just a value that we settled on by experimentation. You can scroll the balloon off the screen by using a larger number.

When COUNT reaches *120*, the program branches to an RTS *without* resetting system timer 2 and, consequently, the scrolling stops. If the scrolling limit has not been reached, then the program stores the COUNT value and continues on to perform the fine scroll in Section 2.

Since the hardware register VSCROL is a write-only register, we cannot read it to find out the last value stored there. As a result, it's necessary to provide a software register, which we've called FINSCL, to keep track of the current fine scrolling number. Once the value in FINSCL has been loaded into the X-register and incremented, it is tested to see if the result is greater than 15. If it is, the program branches to Section 3, the coarse-scrolling section. If the result is less than *15*, it is stored in VSCROL and FINSCL. After this, the program resets CDTMV2 to a non-zero number, so that the OS will follow its routine of decrementing to *0* then JSRing to our subroutine. The value stored in CDTMV2 (that is, 6) was chosen to give a smooth scrolling of the balloon up the screen.

Table 1.

Assembly Language Listing
for
Fine Vertical Scrolling

Register Use:

205=COUNT	Used to limit the balloon's travel up the screen
206=FINSCL	A software register to hold current fine scroll value
LOSCN	Location of lo-byte of screen memory address; the second byte of LMS instruction
HISCN	Location of hi-byte of screen memory address; the third byte of LMS instruction
CDTMV2	System Timer 2
VSCROL	Hardware Fine Scroll Register

LIMIT=120 DELAY=6 FINLIM=16

Section 1: Keeps track of distance scrolled up the screen

	LDY COUNT	164,205	Load count of times scrolled
	INY	200	Increment the count
	CPY LIMIT	192,120	Test for end of scrolling
	BEQ END	240,19	If limit reached, return without timer reset
	STY COUNT	132,205	If limit not reached, store count and continue on to fine scroll

Section 2: Performs the fine scroll

	LDX FINSCL	166,206	Get current fine scroll value
	INX	232	and increment it
	CPX FINLIM	224,16	Test for limit of fine scrolling
	BEQ COARSE	240,11	If limit reached, branch to coarse scroll and reset
	STX VSCROL	142,5,212	else store value in hardware
	STX FINSCL	134,206	and software register
	LDA DELAY	169,6	Reset system
	STA CDTMV2	141,26,2	timer 2
	RTS	96	Return from subroutine

Section 3: Performs the coarse scroll and resets the fine scroll registers.

COARSE	CLD	216	Prepare to add by clearing decimal mode
	CLC	24	and carry flag
	LDA LOSCN	173,4,157	Load Accumulator with lo-byte of screen memory
	ADC #20	105,20	Add the number of bytes in a mode line
	BES HIADD	176,16	If carry results go to increment the hi-bytes, as well
	STA LOSCN	141,4,157	If no carry update LMS low address
	LDA #0	169,0	reset hardware
	STA VSCROL	141,5,212	and
	STA FINSCL	133,207	software registers
	LDA DELAY	169,6	Reset system
	STA CDTMV2	141,26,2	timer 2
	RTS	96	Return from subroutine
HIADD	INC HISCN	238,5,157	Add 1 to LMS high address byte
	STA LOSCN	141,4,157	Update LMS low address byte
	LDA #0	196,0	Reset
	STA VSCROL	141,5,212	hardware and software
	STA FINSCL	133,206	registers
	LDA DELAY	169,6	Reset system
	STA CDTMV2	141,26,2	timer 2
	RTS	96	Return

Now suppose FINSCL was incremented to the number *16*. In that case, the program has to do a coarse scroll, and reset both the hardware and software fine-scrolling registers. This job is performed by Section 3 of the program. Coarse scrolling is accomplished by adding *20* to the lo-byte of the screen memory found in the LMS instruction of the display list.

Two things should be noted here. First, we do a binary addition, so we must *Clear the Decimal Mode* (CLD). Second, adding *20* may result in a number greater than *255*, so we may have to do a simple 2-byte addition. This contingency is provided for by *Clearing the Carry Flag* (CLC) and a *Branch on Carry Set* (BCS). By reading the comments in the accompanying assembly listing (Table 1), you can trace through the way in which these ideas are implemented.

Horizontal scrolling.

We've seen how you can scroll things up or down the screen by changing the address in a single LMS instruction. With horizontal scrolling, the basic idea is to associate an LMS instruction and a section of screen memory with *each* mode line. When the amount of memory reserved is larger than necessary for the number of bytes in the mode line, the display can be scrolled back and forth across the screen by changing the address in the LMS instructions. Figure 4 is a diagram, showing just two mode lines, to help you visualize this concept:

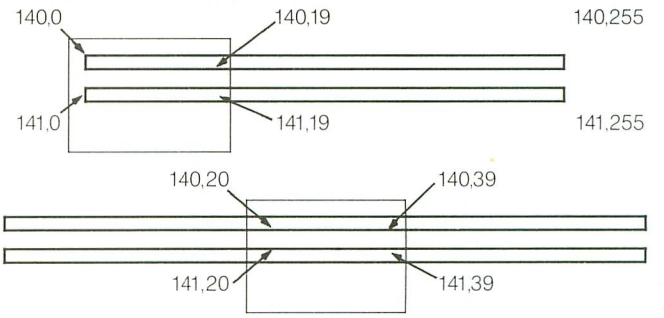

Figure 4. — Horizontal scrolling.

Programming horizontal scrolling is easier if you set aside one page of memory for each mode line you want to scroll. Then you need only manipulate the low address bytes in the LMS instruction.

Just as in vertical scrolling, there is both coarse and fine horizontal scrolling. Fine horizontal scrolling is done in *color clock* units. Color clocks are a way of keeping track of the motion of the electron beam across the TV screen independently of the screen's size. HSCROL is an 8-bit register, but, as with VSCROL, only the lower 4 bits are used. This means the maximum number of color clocks that an image can be fine scrolled is sixteen. The actual number to use depends on the number of color clocks in the characters of the graphics mode you use. Listing 2 is the horizontally-scrolling version of UP! UP! and AWAY!

Assembly language listing.

Table 2 is the machine language horizontal-scrolling subroutine. This routine is slightly shorter and simpler than the vertical scrolling routine. Sections 1 and 2 are

Table 2.

Assembly Language Listing for Fine Horizontal Scrolling

Register Use:

205=COUNT Used to limit the balloon's travel up the screen
206=FINSCL A software register to hold current fine scroll value
CDTMV2 System Timer 2
HSCROL Hardware Fine Scroll Register

Section 1: Keeps track of distance scrolled across the screen

	LDY COUNT	164,205	Load count of times scrolled
	INY	200	Increment the count
	CPY LIMIT	192,200	Test for end of scrolling
	BEQ END	240,19	If limit reached, return without timer reset

Section 2: Performs the fine scroll

	STY COUNT	132,205	Save COUNT value
	LDX FINSCL	166,206	Get current fine scroll value
	INX	232	and increment it
	CPX #8	224,8	Is fine scroll at its maximum?
	BEQ COARSE	240,11	If limit reached, branch to coarse scroll and reset
	STX HSCROL	142,4,212	else store value in hardware
	STX FINSCL	134,206	and software register
	LDA DELAY	169,4	Reset system
	STA CDTMV2	141,26,2	timer 2
	RTS	96	Return from subroutine

Section 3: Performs the coarse scroll and resets the fine scroll registers

COARSE	LDX #0	162,0	Load index value
	DEC SCNADR,X	132,133	Decrement 1st screen address
	INX	232	Increment
	INX	232	register to point to
	INX	232	next screen address
	CPX ENDDL	224,33	Are all addresses incremented?
	BNE	208,246	If not, loop back
	LDA #0	169,0	If yes, reset
	STA HSCROL	141,4,212	hardware and software
	STA FINSCL	133,206	registers
	LDA #4	169,4	Reset system
	STA CDTMV2	141,26,2	timer 2
	RTS	96	Return from subroutine

nearly identical in the two programs. The major differences are that: (1) the balloon is allowed to scroll off the screen horizontally, (2) the fine scrolling increments HSCROL only seven times before it branches to the coarse scroll in Section 3, and, naturally, (3) the fine scroll number must be stored in HSCROL (54276) rather than VSCROL. Compared to the vertical-scrolling routine, Section 3 (coarse scrolling) is simpler because it only needs to increment the low address byte in each LMS instruction. This is done by using the X-register as an index to locate each of the proper bytes in the display list. As before, this part of the program also resets the fine scroll registers to *0* and resets system timer 2 before executing the RTS.

The two programs we have presented illustrate vertical and horizontal fine scrolling. A natural question to ask is: "What happens if we put both movements together?" The answer: we get diagonal scrolling. Listing 3 is the BASIC program, and Table 3 is the assembly language listing for a diagonal-scrolling subroutine.

In this article we have explained the ups, downs and "acrosses" of scrolling. The routines we have given can be modified easily for use in your own programs. A good first exercise is to try vertical scrolling down and horizontal scrolling to the left.

Table 3.

Assembly Language Listing for Fine Diagonal Scrolling

Register Use:

205=COUNT Used to limit the balloon's travel up the screen
206=HFINREG A software register to hold current fine-scroll value
207=VFINREG A software register to hold fine-scroll value

Section 1: Keeps track of distance scrolled across the screen

	LDY COUNT	164,205	Load count of times scrolled
	INY	200	Increment the count
	CPY LIMIT	192,80	Test for end of scrolling
	BEQ END	240,28	If limit reached, return without timer reset

Section 2: Performs the fine scroll

	STY COUNT	132,205	Save COUNT value
	LDX HFINREG	166,206	Get current fine scroll value
	INX	232	and increment it
	CPX #8	224,8	Is fine scroll at its maximum?
	BEQ COARSE	240,20	If limit reached, branch to coarse scroll and reset
	STX HFINREG	134,206	hardware and software register
	STX HSCROL	142,4,212	else store value in hardware
	LDX VFINREG	166,207	Get vertical fine scroll
	INX	232	value and
	INX	232	increment it
	STX VFINREG	134,207	Save vertical fine scroll value
	STX VSCROL	142,5,212	in software and hardware registers
	LDA #6	169,6	Reset system
	STA TIMER	141,26,2	timer 2
END	RTS	96	Return from subroutine

Section Three: Coarse scroll

COARSE	LDX #0	162,0	Load X-register for indexed addressing
LOOP	DEC LOSCNADR,X	222,132,133	change lo-byte of screen address
	INX	232	Inc. to point to hi-byte of screen address
	INC HISCNADR,X	254,132,133	Inc. hi-byte of screen address
	INX	232	Inc. X-register to point
	INX	232	to next lo-byte screen address
	CPX #33	224,33	Are all screen addresses changed?
	BNE LOOP	208,243	If not, branch back
	LDA #0	169,0	If yes, then reset
	STA HFINREG	133,206	software
	STA VFINREG	133,207	and
	STA HSCROL	141,4,212	hardware
	STA VSCROL	141,5,212	registers
	LDA #4	169,4	Reset system
	STA CDTMV2	141,26,2	timer 2
	RTS	96	Return from subroutine

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The two have a book on 6502 assembly language to be published by Weber Systems, Inc., now in the proofing stage. They've published articles on graphics, bank-switching on the XE and Logo data management.

The two-letter checksum code preceding the line numbers here is *not* a part of the BASIC program. For further information, see the *BASIC Editor II*, in issue 47.

Listing 1.
BASIC listing.

```
BA 10 REM UP! UP! AND AWAY!
XB 20 REM FINE VERTICAL SCROLLING
MS 30 REM DURING THE VERTICAL BLANK
VP 40 REM ROUTINE IS LINKED USING
GM 50 REM SYSTEM TIMER TWO
SG 60 REM BY ALLAN MOOSE/MARIAN LORENZ
AF 70 REM ***** 1985 *****
PQ 80 REM DIMENSION AND DEFINE STRINGS TH
   AT STORE ML ROUTINES
HX 90 REM AND CHARACTER SET
KQ 100 DIM EMPTY$(18),TRANS$(20),CHANGE$(
   14),BAL$(88)
LR 120 RESTORE 700:FOR X=1 TO 18:READ A:E
   MPTY$(X)=CHR$(A):NEXT X
SM 140 FOR X=1 TO 20:READ A:TRANS$(X)=CHR
   $(A):NEXT X
BW 160 FOR X=1 TO 13:READ A:CHANGE$(X)=CH
   R$(A):NEXT X
RL 180 FOR X=1 TO 88:READ A:BAL$(X)=CHR$(
   A):NEXT X
XI 190 REM SET UP RESERVED SPACE AND CLEA
   R
SH 200 POKE 106,148:POKE 203,0:POKE 204,1
   48
AB 210 EMPTY=USR(ADR(EMPTY$))
HJ 220 REM SET GRAPHICS MODE AND COLORS
VS 230 GRAPHICS 18:POKE 752,1:POKE 708,88
   :POKE 712,160
FP 240 REM MOVE STANDARD CHARACTERS/REDEF
   INE
RF 250 POKE 205,0:POKE 206,224
WA 260 MOVE=USR(ADR(TRANS$))
HL 270 Q=ADR(BAL$)
YF 280 HIQ=INT(Q/256)
VP 290 LOQ=Q-HIQ*256
EI 300 POKE 205,LOQ:POKE 206,HIQ
BD 310 POKE 203,24:POKE 204,148
UF 320 R=USR(ADR(CHANGE$))
KB 330 REM SET UP CUSTOM DISPLAY LIST
IX 340 FOR I=0 TO 2:POKE 40192+I,112:NEXT
    I
DQ 350 POKE 40195,103:REM SCROLLING BIT S
   ET (64+7+32=103)
GK 360 POKE 40196,0:POKE 40197,154
FI 370 FOR I=0 TO 9:POKE 40198+I,39:NEXT
   I:REM SCROLL BIT SET AT EVERY LINE (7+
   32=39)
TQ 380 POKE 40208,7
CH 390 POKE 40209,65
PN 400 POKE 40210,0:POKE 40211,157
TM 410 REM TELL ANTIC AND OS WHERE DL AND
    SCREEN MEMORY ARE
NP 420 POKE 559,0:REM TURN OFF SCREEN
AT 430 POKE 560,0:POKE 561,157
EY 440 POKE 88,0:POKE 89,154
FJ 450 POKE 756,148:REM INSTALL CHARACTER
    SET ADDRESS
MZ 460 POKE 559,34:REM TURN ON SCREEN
CY 470 REM PUT BALLOON   IN MEMORY
XM 480 POSITION 6,7:PRINT #6;"#$%"
IF 490 POSITION 6,8:PRINT #6;"&'("
SF 500 POSITION 6,9:PRINT #6;")*+"
QY 510 POSITION 7,10:PRINT #6;",-"
SU 520 POSITION 7,11:PRINT #6;"./"
KT 530 REM LOAD IN SCROLL ROUTINE
MP 540 RESTORE 560:FOR I=0 TO 70:READ SCR
   OLL:POKE 40448+I,SCROLL:NEXT I
WG 550 REM DATA FOR SCROLL ROUTINE
GZ 560 DATA 164,205,200,192,120,240,19,13
   2,205,166,206,232,224,16,240,11,142,5,
   212,134
OB 580 DATA 206,169,6,141,26,2,96,216,24,
   173,4,157,105,20,176,16,141,4,157,169,
   0,141,5,212,133
UT 600 DATA 206,169,6,141,26,2,96,238,5,1
   57,141,4,157,169,0,141,5,212,133,206,1
   69,6,141,26,2,96
VM 620 REM INSTALL ADDRESS OF THE SCROLLI
   NG PROGRAM
DH 630 POKE 552,0:POKE 553,158
ZV 640 REM SET REGISTERS USED BY SCROLLIN
   G ROUTINE
MP 650 POKE 205,0:POKE 206,0:POKE 54277,0
RI 660 REM START SYSTEM TIMER 2
MU 670 POKE 538,10
RJ 680 GOTO 680
CN 690 REM DATA FOR EMPTY$
UV 700 DATA 104,169,0,162,8,160,0,145,203
   ,200,208,251,230,204,202,208,246,96
UN 710 REM DATA FOR TRANS$
UE 720 DATA 104,162,4,160,0,177,205,145,2
   03,200,208,249,230,206,230,204,202,208
   ,242,96
BW 730 REM DATA FOR CHANGE$
BT 740 DATA 104,160,0,177,205,145,203,200
   ,192,88,208,247,96
YK 750 REM DATA FOR BAL$
TH 760 DATA 0,0,1,3,7,15,31,31,0,126,255,
   255,255,255,255,255,0,0,128,192,224,24
   0,248,248,63
JZ 780 DATA 63,63,63,63,63,63,63,255,255,
   255,255,255,255,255,255,252,252,252,25
   2,252,252,252,248,31,15
WT 790 DATA 7,3,1,0,0,0,255,255,255,255,2
   55,255,126,126,248,240,224,192,128,0,0
   ,0,36,36,36
JI 800 DATA 36,255,255,255,255,255,255,25
   5,126,0,0,0,0
```

Listing 2.
BASIC listing.

```
BA 10 REM UP! UP! AND AWAY!
NS 20 REM FINE HORIZONTAL SCROLLING
MS 30 REM DURING THE VERTICAL BLANK
VP 40 REM ROUTINE IS LINKED USING
GM 50 REM SYSTEM TIMER TWO
SG 60 REM BY ALLAN MOOSE/MARIAN LORENZ
AF 70 REM ***** 1985 *****
RK 80 REM **   VERSION 2  **
IZ 90 RESTORE 110
SN 100 FOR NUM=0 TO 17:READ EMPTY:POKE 16
```

```
   06+NUM,EMPTY:NEXT NUM
FB 110 DATA 104,169,0,162,28,160,0,145,20
   3,200,208,251,230,204,202,208,246,96
TD 120 RESTORE 140
XD 130 FOR NUM=0 TO 19:READ TRANS:POKE 16
   25+NUM,TRANS:NEXT NUM
UC 140 DATA 104,162,4,160,0,177,205,145,2
   03,200,208,249,230,206,230,204,202,208
   ,242,96
UZ 150 RESTORE 170
VV 160 FOR NUM=0 TO 12:READ CHANGE:POKE 1
   646+NUM,CHANGE:NEXT NUM
SH 170 DATA 104,160,0,177,205,145,203,200
   ,192,144,208,247,96
RY 180 RESTORE 200
SY 190 FOR NUM=0 TO 87:READ BALL:POKE 166
   1+NUM,BALL:NEXT NUM
NU 200 DATA 0,0,1,3,7,15,31,31,0,126,255,
   255,255,255,255,255,0,0,128,192,224,24
   0,248,248
XF 210 DATA 63,63,63,63,63,63,63,63,255,2
   55,255,255,255,255,255,255,252,252,252
   ,252,252,252,252,248
DB 220 DATA 31,15,7,3,1,0,0,0,255,255,255
   ,255,255,255,126,126,248,240,224,192,1
   28,0,0,0,36,36,36,36
KX 230 DATA 255,255,255,255,255,255,255,1
   26,0,0,0,0
WZ 240 REM SET UP RESERVED SPACE AND CLEA
   R
FV 250 POKE 106,133:POKE 203,0:POKE 204,1
   33
EH 260 EMPTY=USR(1606)
HT 270 REM SET GRAPHICS MODE AND COLORS
WC 280 GRAPHICS 18:POKE 752,1:POKE 708,88
   :POKE 712,160
FZ 290 REM MOVE STANDARD CHARACTERS/REDEF
   INE
QW 300 POKE 205,0:POKE 206,224
AQ 310 TRANS=USR(1625)
CI 320 POKE 205,125:POKE 206,6
VY 330 POKE 203,24:POKE 204,134
QU 340 CHANGE=USR(1646)
KF 350 REM SET UP CUSTOM DISPLAY LIST
PV 360 FOR I=0 TO 2:POKE 34176+I,112:NEXT
    I:REM BLANK SCAN LINES
FM 370 FOR I=0 TO 10:POKE 34179+I*3,87:NE
   XT I:REM SCROLL SET EVERY MODE LINE
CE 380 FOR I=0 TO 10:POKE 34180+I*3,128:N
   EXT I:REM SET LO SCRN ADDRESS
BW 390 FOR I=0 TO 10:POKE 34181+I*3,138+I
   :NEXT I:REM SET HI SCRN ADDRESS
ZR 400 POKE 34212,65
IA 410 POKE 34213,128
FV 420 POKE 34214,133
CN 430 REM TELL ANTIC WHERE TO FIND DL
NT 440 POKE 559,0:REM TURN OFF SCREEN
LV 450 POKE 560,128:POKE 561,133
AZ 460 POKE 756,134:REM INSTALL CHARACTER
    SET ADDR
NB 470 POKE 559,34:REM TURN ON SCREEN
BG 480 REM POKE CHAR CODES DIRECTLY INTO
   MEMORY
VN 490 POKE 144*256+130,3:POKE 144*256+13
   1,4
AY 500 POKE 144*256+132,5:POKE 145*256+13
   0,6
IO 510 POKE 145*256+131,7:POKE 145*256+13
   2,8
YF 520 POKE 146*256+130,9:POKE 146*256+13
   1,10
LA 530 POKE 146*256+132,11:POKE 147*256+1
   31,140
OH 540 POKE 148*256+131,141
KX 550 REM LOAD IN SCROLL ROUTINE
GY 560 FOR I=0 TO 51:READ SCROLL:POKE 153
   6+I,SCROLL:NEXT I
RE 570 REM
HT 580 DATA 164,205,200,192,200,240,19,13
   2,205,166,206,232,224,8,240,11,142,4,2
   12,134
RI 590 REM
YU 600 DATA 206,169,6,141,26,2,96,162,0,2
   22,132,133,232,232,232
QT 610 REM
WJ 620 DATA 224,33,208,246,169,0,141,4,21
   2,133,206,169,4,141,26,2,96
QX 630 REM
VQ 640 REM INSTALL ADDRESS OF THE SCROLLI
   NG PROGRAM
BC 650 POKE 552,0:POKE 553,6
ZZ 660 REM SET REGISTERS USED BY SCROLLIN
   G ROUTINE
LJ 670 POKE 205,0:POKE 206,0:POKE 54276,0
RM 680 REM START SYSTEM TIMER 2
MY 690 POKE 538,10
NU 700 GOTO 700
```

●

Listing 3.
BASIC listing.

```
BA 10 REM UP! UP! AND AWAY!
JY 20 REM FINE DIAGONAL SCROLLING
MS 30 REM DURING THE VERTICAL BLANK
VP 40 REM ROUTINE IS LINKED USING
GM 50 REM SYSTEM TIMER TWO
SG 60 REM BY ALLAN MOOSE/MARIAN LORENZ
AF 70 REM *****  1985  *****
RK 80 REM **   VERSION 2  **
IZ 90 RESTORE 110
SN 100 FOR NUM=0 TO 17:READ EMPTY:POKE 16
   06+NUM,EMPTY:NEXT NUM
FB 110 DATA 104,169,0,162,28,160,0,145,20
   3,200,208,251,230,204,202,208,246,96
TD 120 RESTORE 140
XD 130 FOR NUM=0 TO 19:READ TRANS:POKE 16
   25+NUM,TRANS:NEXT NUM
UC 140 DATA 104,162,4,160,0,177,205,145,2
   03,200,208,249,230,206,230,204,202,208
   ,242,96
UZ 150 RESTORE 170
VV 160 FOR NUM=0 TO 12:READ CHANGE:POKE 1
   646+NUM,CHANGE:NEXT NUM
SH 170 DATA 104,160,0,177,205,145,203,200
   ,192,144,208,247,96
RY 180 RESTORE 200
SY 190 FOR NUM=0 TO 87:READ BALL:POKE 166
   1+NUM,BALL:NEXT NUM
NU 200 DATA 0,0,1,3,7,15,31,31,0,126,255,
   255,255,255,255,255,0,0,128,192,224,24
   0,248,248
XF 210 DATA 63,63,63,63,63,63,63,63,255,2
   55,255,255,255,255,255,255,252,252,252
   ,252,252,252,252,248
DB 220 DATA 31,15,7,3,1,0,0,0,255,255,255
   ,255,255,255,126,126,248,240,224,192,1
   28,0,0,0,36,36,36,36
KX 230 DATA 255,255,255,255,255,255,255,1
   26,0,0,0,0
WZ 240 REM SET UP RESERVED SPACE AND CLEA
   R
FV 250 POKE 106,133:POKE 203,0:POKE 204,1
   33
EH 260 EMPTY=USR(1606)
HT 270 REM SET GRAPHICS MODE AND COLORS
WC 280 GRAPHICS 18:POKE 752,1:POKE 708,88
   :POKE 712,160
FZ 290 REM MOVE STANDARD CHARACTERS/REDEF
   INE
QW 300 POKE 205,0:POKE 206,224
AQ 310 TRANS=USR(1625)
CI 320 POKE 205,125:POKE 206,6
```

```
VY 330 POKE 203,24:POKE 204,134
QU 340 CHANGE=USR(1646)
KF 350 REM SET UP CUSTOM DISPLAY LIST
PV 360 FOR I=0 TO 2:POKE 34176+I,112:NEXT
    I:REM BLANK SCAN LINES
LP 370 FOR I=0 TO 10:POKE 34179+I*3,119:N
   EXT I:REM SCROLL SET EVERY MODE LINE
CE 380 FOR I=0 TO 10:POKE 34180+I*3,128:N
   EXT I:REM SET LO SCRN ADDRESS
BW 390 FOR I=0 TO 10:POKE 34181+I*3,138+I
   :NEXT I:REM SET HI SCRN ADDRESS
ZR 400 POKE 34212,65
IA 410 POKE 34213,128
FV 420 POKE 34214,133
CN 430 REM TELL ANTIC WHERE TO FIND DL
NT 440 POKE 559,0:REM TURN OFF SCREEN
LV 450 POKE 560,128:POKE 561,133
AZ 460 POKE 756,134:REM INSTALL CHARACTER
    SET ADDR
NB 470 POKE 559,34:REM TURN ON SCREEN
BG 480 REM POKE CHAR CODES DIRECTLY INTO
   MEMORY
VN 490 POKE 144*256+130,3:POKE 144*256+13
   1,4
AY 500 POKE 144*256+132,5:POKE 145*256+13
   0,6
IO 510 POKE 145*256+131,7:POKE 145*256+13
   2,8
YF 520 POKE 146*256+130,9:POKE 146*256+13
   1,10
LA 530 POKE 146*256+132,11:POKE 147*256+1
   31,140
OH 540 POKE 148*256+131,141
KX 550 REM LOAD IN SCROLL ROUTINE
MD 560 FOR I=0 TO 68:READ SCROLL:POKE 153
   6+I,SCROLL:NEXT I
RE 570 REM
QM 580 DATA 164,205,200,192,80,240,28,132
   ,205,166,206,232,224,8,240,20
FY 590 DATA 134,206,142,4,212,166,207,232
   ,232,134,207
HQ 600 DATA 142,5,212,169,6,141,26,2,96
WA 610 DATA 162,0,222,132,133,232,254,132
   ,133
VU 620 DATA 232,232,224,33,208,243,169,0,
   133,206
NG 630 DATA 133,207,141,4,212,141,5,212,1
   69,4,141,26,2,96
VQ 640 REM INSTALL ADDRESS OF THE SCROLLI
   NG PROGRAM
BC 650 POKE 552,0:POKE 553,6
ZZ 660 REM SET REGISTERS USED BY SCROLLIN
   G ROUTINE
JX 670 POKE 205,0:POKE 206,0:POKE 207,0:P
   OKE 54276,0
RM 680 REM START SYSTEM TIMER 2
MY 690 POKE 538,10
NU 700 GOTO 700
```

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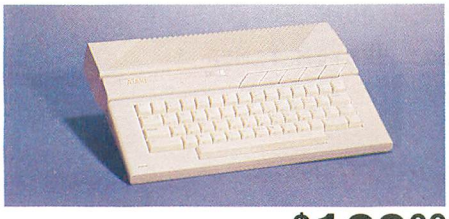

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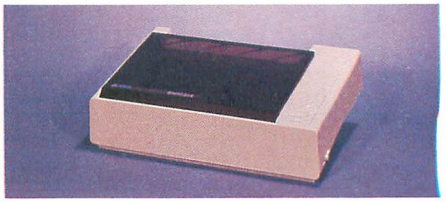

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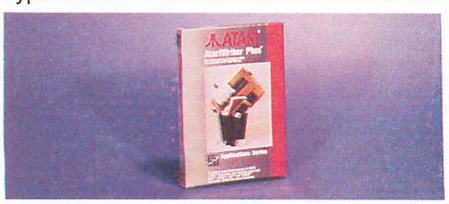

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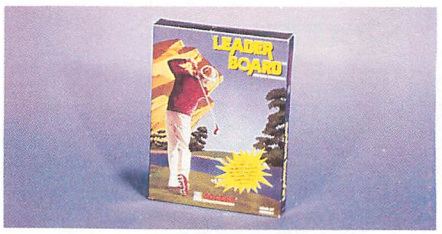

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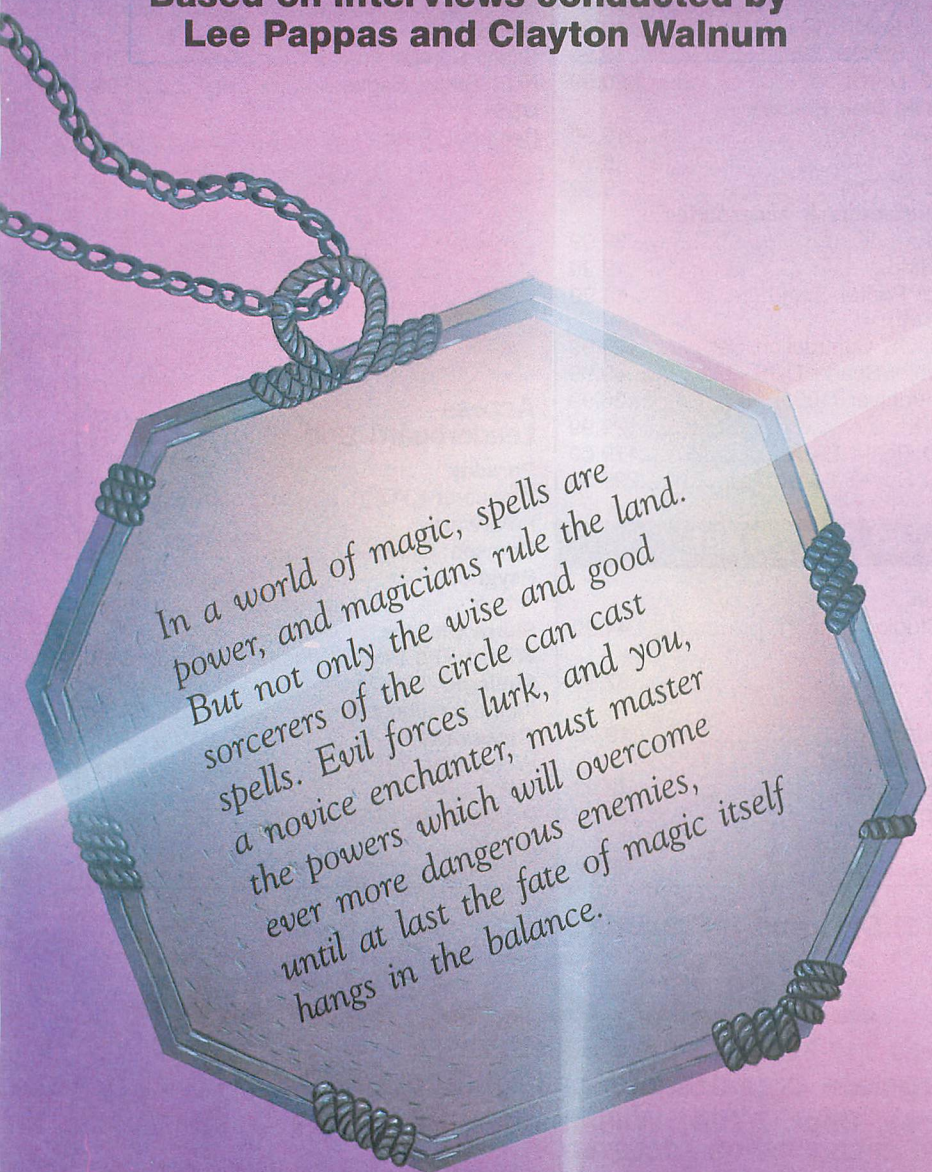
Beyond Zork:
An intimate look at Infocom, Inc.

Based on interviews conducted by Lee Pappas and Clayton Walnum



by Clayton Walnum

Scene one.

"Okay, let's go."

"Yup."

"We didn't move. The two of us stared up the length of the six-story, glass-and-steel corporate monolith rising before us. The crisp December morning air pinched at our cheeks, bringing blood to the surface. Subtle shivers rippled through me. Belboz only knew what could be in there.

I repositioned the coil of rope looped over my shoulder and flicked the switch of the flashlight. The bulb struggled into yellow life, then slipped back to dark oblivion.

"You got a spell memorized?"

He nodded. His tongue crept out, then went back into hiding.

"Which one?" I asked.

"Ozmoo, of course."

"Yeah, that's the one to know." It was a grim thought, but without the Ozmoo spell, who could say if we'd even survive?

"Okay, let's go."

"Yup."

I cleared my throat.

I shuffled my feet.

I stared up.

The fifth floor, the Infocom lair, leered down. Come to us, oh friends, came the siren call. We have myriad surprises. Yes, indeed, we do. Wander rock-strewn passageways! Become hopelessly lost in sadistic mazes! Battle trolls and dwarves! Pay an additional $7.95 for a hint book! Krill

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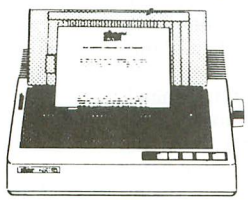

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CIRCLE #146 ON READER SERVICE CARD

awaits you. And he's *very* anxious to make your acquaintance.

I shivered, glanced down at the bright yellow circle pinned to my jacket. "DON'T PANIC," it read. Good advice, but its implications were not terrifically hopeful.

My companion took a step forward, then stopped.

"Let's do it," he urged.

"Yup."

There *was* a bright side. I tried to think of the treasures waiting to fill our fur-lined pockets. Rare art. Gold coins. Diamonds. Review copies of software.

"There's monsters in there," I murmured to no one in particular. "And Grues!"

My companion frowned. "What is a Grue?"

"The Grue is a sinister, lurking presence in the dark places of the Earth. Its favorite diet is adventurers, but its insatiable appetite is tempered by its fear of light. No Grue has ever been seen in the light of day, and few have survived its fearsome jaws to tell the tale. . .Gosh, that sounds familiar, doesn't it?"

"Here we go," he said.

"Yup."

I assembled all the courage I had hoarded over what was sure to be a short life and pulled open the door.

Immediately, we were swallowed by a swirling blackness, a vortex that sucked us down past scenes of oceans and caverns and castles, alien landscapes and gothic mansions. There were gunshots and the clanging of swords. Screams and whimpering. Chuckles and bellows. The face of a horrible, alien creature swam up from the darkness, mouthing words that brought my stomach up to the base of my throat: "Oh freddled gruntbuggly, . . .thy nacturations are to me/As plurdled gabbleblotchits on a lurgid bee." A pyramid, its ancient surface baked dry in the desert sun, burst into view, whirled by us and was gone. Then a rumble. At first felt more than heard, it built to a deafening crescendo, and a huge mushroom of radioactive dust glared down on us, the face of a god. The shock waves and winds hit. A billion scratch-and-sniff cards bubbled out from the tornado, forcing upon us olfactory tortures beyond imagining.

My fellow adventurer screamed, hid his nose behind his hands. "The hint book! We're really going to need the stupid hint book!"

My fingers jabbed at the air.

To hell with hint books. Where was the blasted RESET key?

Scene two.

Visiting the offices of Infocom, Inc. is sure to stimulate the imagination of even the most feeble of intellects—as the above paragraphs surely serve witness.

Ahem. . .that didn't really come out as I meant it to, did it? I was, of course, not implying any feebleness on the part of *my* mind (although there are many who would argue that, implied or not, the encroaching ruin of my gray matter is an undeniable fact), but that the thought of a visit to the official headquarters of Zork, *et al*. is, for anyone, a great stimulant to the imaginative juices.

The fine people at Infocom have offered up such a huge array of stimulating tales —always of unimpeachable quality—one could say they may have single-handedly backed an entire industry. Quite a claim, eh? Let me explain.

Talk to any adventure addict. Go ahead, pick one. Ready? Ask him whose games have consistently provided the most detailed, creative, funny and absorbing hours of play. What did he say? Just as I thought. You see, confronted with a shelf-ful of text adventure games, adventurers in the know will, nine out of ten times, choose the Infocom game. It's a non-risk, a sure winner, guaranteed to provide more than adequate compensation for the thin green slips of paper traded for it.

But I still haven't substantiated the outrageous claim I made two paragraphs ago. The substantiation is in the quality. When gamers finish the latest Infocom title, they want more. . .because the game's *quality* left them feeling that way. And what does one do when one has finished that new Infocom game, having played all the others within a week of their release? One purchases a competitor's game, of course.

I'm not implying that Infocom's competitors supply inferior products. There are many fine adventures under other trademarks. As a great movie bolsters the film industry by drawing audiences back to the theaters, Infocom games create an unyielding urge to play adventure games—by the dozens.

In the beginning.

It's ironic, then, that when Infocom first sprang into the imaginations of its founders, games were the furthest thing from their minds.

The name *Infocom* is an amalgamation of the words *information*, *communication* and *computer*. Doesn't sound very "gamey," does it? Infocom's original objective was to supply some competition to companies providing large-scale business programs (such as Lotus 1-2-3) to the growing corporate market. A special project was begun. Shrouded in secrecy, behind locked doors in their computer rooms (I exaggerate slightly), the programmers set to work. What emerged after several years of grueling labor was the impressive (but underachieving) **Cornerstone** package.

But I get ahead of myself. A new company, as Infocom was then, has a burgeoning need for additional capital. Someone has to pay the staff and the rent, and three years tucked away in front of glowing CRTs

working on a single long-term project do not revenue make.

Well, there was this game **Zork**, which Dave Lebling, Marc Blank, Tim Anderson and Bruce Daniels had up and running on a mainframe. They emerged from their underground labyrinth long enough to look around and say, "Hey, these new microcomputers are doing pretty well; in fact, people seem to be scoffing them up like free tickets to a Beatles concert. Why don't we port this thing over to a couple of home computers and see how it sells? That'll get the checks signed while the *serious* work is going on."

History springs from most humble beginnings.

Zork sold. The reviews began rolling in, praising the ahead-of-its-time parser and imaginative prose. **Zork II** eased tentatively into the marketplace. It sold. Reviews rolled in again. Then came **Zork III**. . . and the sales. . .and reviews. New games emerged featuring innovative packaging; people bought them just for the box!

Humble beginnings, you know. . . And never looking back.

The zany Infocom of today.

Infocom has created a reputation for itself that swings far wide of the corporate reality. The games get crazier and crazier. Infocom's newsletter *The Status Line* (formerly *The New Zork Times*, until a certain unamused newspaper brought down the axe) has done nothing to tarnish the carefully constructed atmosphere of insane joviality that permeates every product leaving the warehouses.

I hate to shatter those pictures waltzing in your head, but the truth is that it's unlikely you'll ever find these folks thirsting for a trip into a dangerous underground maze. They're a young, intelligent, professional lot. And, as such, their primary concerns are not focused on what they'll wear to the next Enchanter's Circle, or even on whose turn it is to be Dungeon Master (although they sometimes argue about who bought the Cheese Doodles). Their concern is the product: the finest they're capable of making.

Ah, the product. . .

It all starts with an idea. It may be a fascinating puzzle; it may be a mystery that needs a solution; it may be nothing more than a intriguing entry on an object list that insists upon its own tale. Whatever the trigger, it's up to Infocom's team of writers to come up with the stories—and come up with them they do. Since the publication of **Zork** in 1980, Infocom has released over twenty complex adventures, with more waiting in the wings.

Each writer has his or her own style for developing a tale. Dave Lebling (**Zork I**, **Zork II**, **Zork III**, **Starcross**, **Enchanter**, **Spellbreaker** and **Suspect**) likes to begin with a setting, then sprinkle interesting objects about. As the setting comes to life, the objects start to suggest plot and puzzle possibilities. The exception to this is when he's working on a mystery; in that case, obviously, the plot must come first.

Steve Meretzky (**Planetfall**, **Sorcerer**, **Hitchhiker's Guide to the Galaxy**, **A Mind Forever Voyaging** and **Leather Goddesses of Phobos**), the comedian of the group, writes several brief ideas on a piece of paper, then asks his associates to pick their favorite one. He will then cross the chosen ideas off the list and begin work on the one nobody picked. (That's Steve for you.) Once he's got the basic idea nailed down, he fleshes out the story line and creates the geography. Rather than place objects into his story right away, he first works out the puzzles. The objects needed to complete the puzzles (and any other fun things he wants to toss in) are then placed in the game.

Stu Galley (**The Witness**, **Seastalker** and **Moonmist**) takes an approach similar to Steve's, circulating his ideas and getting opinions from the others. Stu treats the voting procedure in the more traditional manner, however, choosing the story line that most people liked.

Amy Briggs (the newest member of the team, and the only female) says she makes "copious notes then completely rewrite[s] them because they're all wrong." She must have gotten her notes in order, though; she's hard at work on her first game.

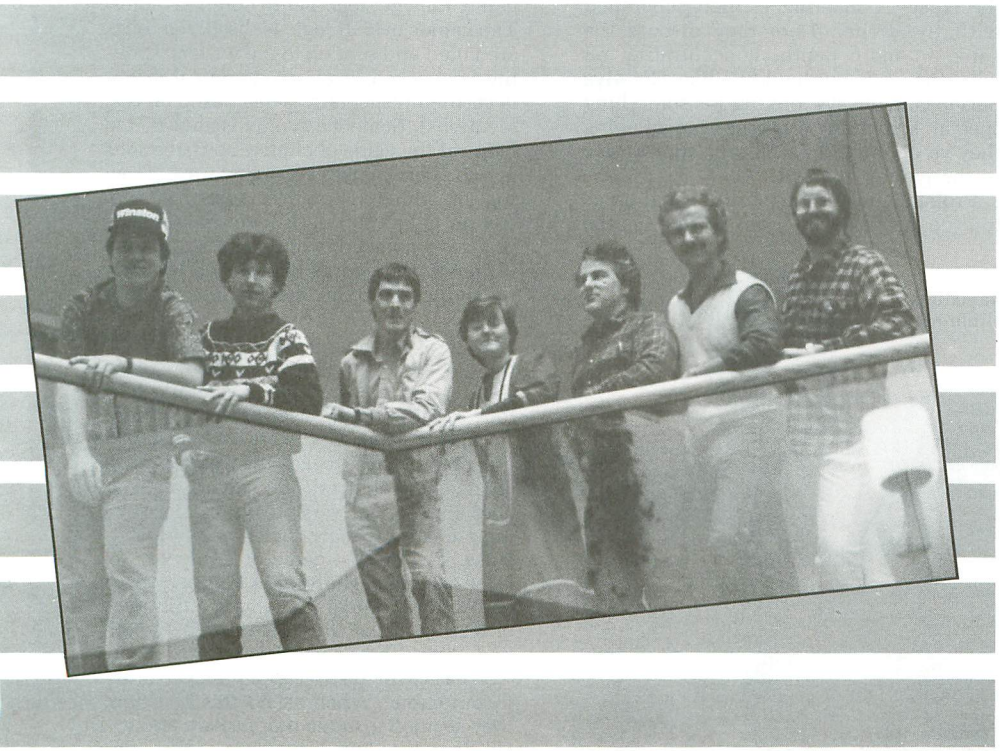
Generally, the writers have free rein over their ideas. There is no formal approval process that must be adhered to (as in most of today's bureaucratic business). The story ideas prove themselves over the course of their development, as more and more people become involved, and contribute their opinions and ideas.

The system must work. Only one product has ever been scrapped beyond the initial testing stage.

Sometimes ideas are put on a back burner, but rarely is one scrapped. When Brian Moriarty (a former **ANALOG Computing** editor) began at Infocom, he had already started to formulate the plot of his latest game, **Trinity**. Infocom thought the idea was too complex. At the time, they really needed another beginner-level game. So Brian began creating **Wishbringer**. Once **Wishbringer** was on the market, work on **Trinity** (finished about eight months ago) resumed.

The hardware and software.

All of Infocom's games are written on a DEC-20 mainframe (named Fred) using their own development language. The language, dubbed ZIL (Zork Implementation Language) is a cousin to LISP, the language popular with programmers involved in the artificial intelligence field. ZIL includes a full list of the most common words used in Infocom games, ready-to-go. When one

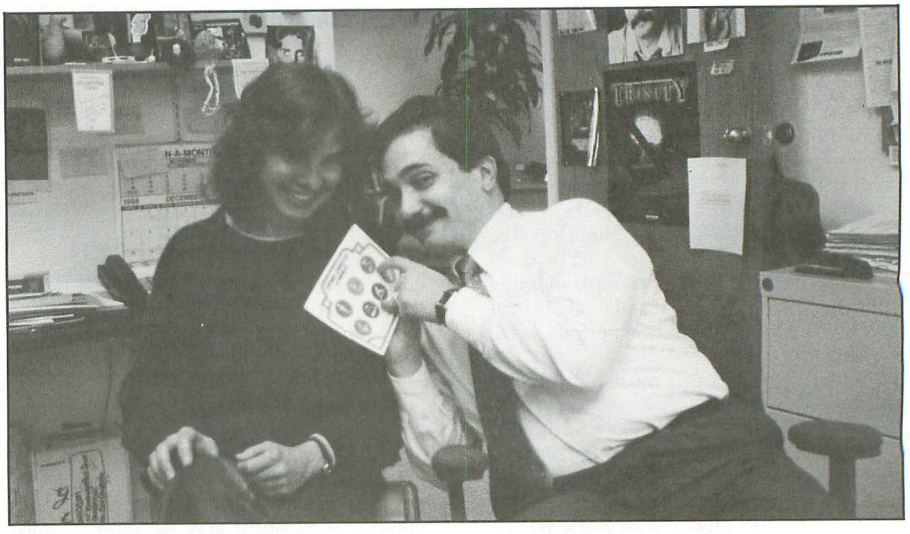


Infocom's infamous circle of writers (left to right): Dave Anderson, Brian Moriarty, Jeff O'Neill, Amy Briggs, Dave Lebling, Stu Galley and Steve Meretzky.

of the writers gets to work on a new project, he or she has to worry only about the new words needed in the game.

Parsers are personal things, however. Each of the writers has a slightly different idea of the way certain words should be implemented. As a result, they each have their own copy of the parser, one that has been "tweaked" up a bit to reflect the current project's needs. Sometimes, for example, the word *put* may require a particular meaning in a given set of circumstances. Out comes the parser for a modification and *put* takes on a new responsibility.

ZIL is a very "high-level" language (akin to some of the fourth-generation languages gaining popularity in the business world) that takes only limited training to get acquainted with. As a result, writers at Infocom need not be programmers; their imagination and sense of adventure adequately carry them through the process of game development.



Elizabeth Langosy and Carl Genatossio of Creative Services.

The "feelies."

Stories are what Infocom really sells, but they're still only a portion of the labor that must be completed to place the product into the consumer's hands. Someone has to sit down and design packages and write copy—not to mention negotiate with the writers about whether that "feelie" (that's the Infocom name for the fun stuff in the box) they want included is feasible or not. Special items, such as the glowing rock packaged with **Wishbringer**, must be researched, priced and checked for safety (the ingredient that causes the rock to glow was replaced with a different substance, due to the toxicity of the original choice). These responsibilities fall on the shoulders of Carl Genatossio and Elizabeth Langosy, the two members of the Infocom Creative Services department.

Carl handles the graphics end, designing the packages, hiring photographers and pulling together all the items to make the package special. He can tell you where to find pizza-smelling ink, or a wishbringer stone, or palm-tree swizzle sticks. Keep him in mind for your next party.

Elizabeth is Infocom's resident writer. She supplies much of the text for manuals and product announcements.

Carl's and Elizabeth's jobs begin when they sit down to play a new game, spending about a week to become familiar with the story. A meeting is then scheduled with the writer. Here they discuss the game in more depth, concentrating on what the package should be like. Creative Services is always looking for something special, something different from anything they've done before, but still appropriate to the game's concept.

Probably one of the most unusual items to crop up in an Infocom package is the scratch-and-sniff card that rounds out the **Leather Goddesses** package. There are still horror stories circulating in the Infocom offices about the day they had to sample the different odors. I bet there was no lunch *that* day.

From Marketing, Gayle Syska and Michael Dornbrook.

The testers.

Sooner or later, a game in development reaches the point of playability. It then falls into the hands of Infocom's five-person testing team. After each has tried out the game, they get together to compare notes. The game's overall logic is discussed; bugs are noted and sent on to the writers; spelling is checked; even geographical layout is verified (especially when based on real locations). Sentence syntax is analyzed to help rid the game of clumsy constructions and to offer the player as many ways of saying something as possible. A lot of concentration is focused on Infocom's infamous puzzles—adjusting each puzzle's difficulty to match the game's experience level, or removing those that are inappropriate or boring.

Suggestions are forwarded to the writer, the changes made, and the cycle repeats. The testing process may take as much as four months before everyone's satisfied.

Once a game has been cleaned up, it goes into "final freeze." At this stage, no changes are allowed; the game is considered in its final version, and the testers must ensure the product is ready for release. The newest game on Infocom's release schedule, **Hollywood Hijinx** by newcomer Dave Anderson, was in this stage of testing at the time of **ANALOG's** visit and should be released soon.

What is the testing group's favorite Infocom game? When asked this question, they seemed to agree that it's **Hitchhiker's Guide**, not so much because of the story, but because of the interesting bugs which popped up. For instance, when trying to

solve the Babel fish puzzle, if you've put your head or foot on Ford's satchel when it's hit by the robot, both your head and foot will fly up in the air. Sounds uncomfortable.

But, bugs or not, when the conversation became more relaxed, everyone had something to say about a much newer and controversial game—**Leather Goddesses of Phobos**.

It seems that the sexual theme of **Leather Goddesses** brought out a portion of each tester's personality that the others had not been aware of. The game's report sheets became a source of shock and amazement. Frequently, shrieks of "I can't believe you tried that!" echoed in the halls. Hmmm. Stirs speculation, doesn't it?

Infocom and Activision.

When Infocom's purchase by Activision was made public, many loyal adventurers were seized with panic. What was going to happen now? Would Infocom go down the corporate tubes? Well, you can relax. The buyout actually had little effect on Infocom. Operations are a little more bureaucratic and systemized, time schedules are not as loose and comfortable as they were in the past, and sometimes Activision executives wander about the offices—but, for the most part, life at Infocom goes on in much the same way as it did before.

The fact is: people at Activision know a winner when they see one. Activision doesn't even want their trademark appearing on the game packages, lest that company's image change the one that Infocom has worked so hard to form.

Time to disembark.

That about finishes our tour of Infocom, Inc. There are other important people we haven't mentioned, not the least of whom are in Infocom's Customer Support department. These five people handle such tasks as replacing defective disks, answering product questions (no adventure clues, so put down that phone), and handling upgrades (that 5¼-inch disk of yours can be upgraded to a 3½ for $10.00, should you ever get an ST). Calls and letters come in from all over the world. This department even got a call from NASA once. Seems they wanted a bunch of DON'T PANIC buttons. Honest.

Infocom testers (left to right):
Gary Brennan, Tomas Bok, Suzanne Frank, Max Buxton and Liz Cyr-Jones.

In Customer Support (left to right):
Kathy Bagdonas, Lisa Fratto, Curtis Montague, Heidi Korn and Stacey Johnson.

Scene three.

"Well, we made it."

"Yup."

We stood beside the car, taking a last look at the building where it had all taken place. The adventure was over. I flicked the switch of the flashlight. Nothing. The batteries were dead.

"Okay, let's go."

"Yup."

We got in the car. The engine rumbled to life, and we pulled out. . .

And I had the strangest feeling.

"You know, I think there's something in the back seat."

"Like what?"

I shrugged. "I don't know. . .something that doesn't belong there. Do you hear breathing?"

"Yup."

We looked at each other and said nothing more. There was definitely something in the back—maybe even a Grue—but that was to be expected. Those Infocom games really stick with you.

ANALOG Computing would like to thank Spencer Steere for the fine job she did in arranging our visit and scheduling the interviews. We wish her happiness in her recent marriage and the best of luck in her new life.

At left: Spencer Steere of Public Relations.

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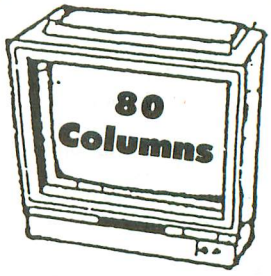

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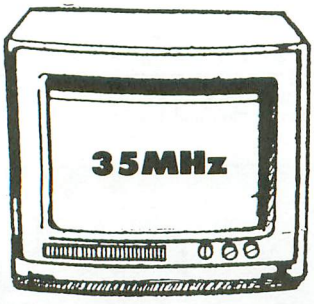

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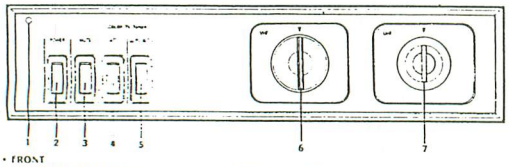

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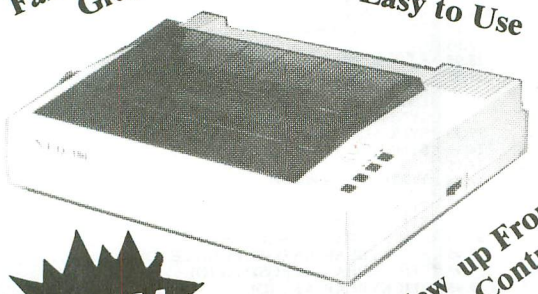

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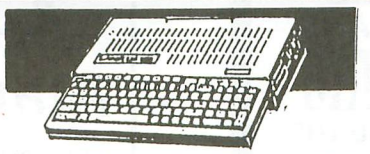

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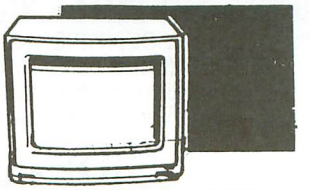

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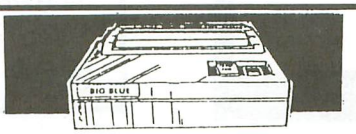

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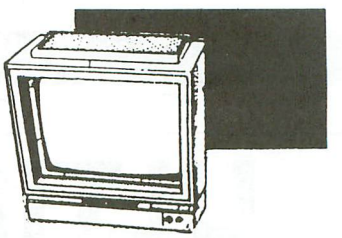

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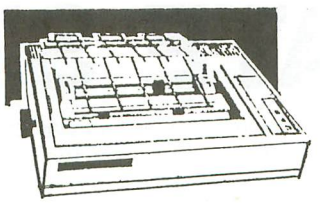

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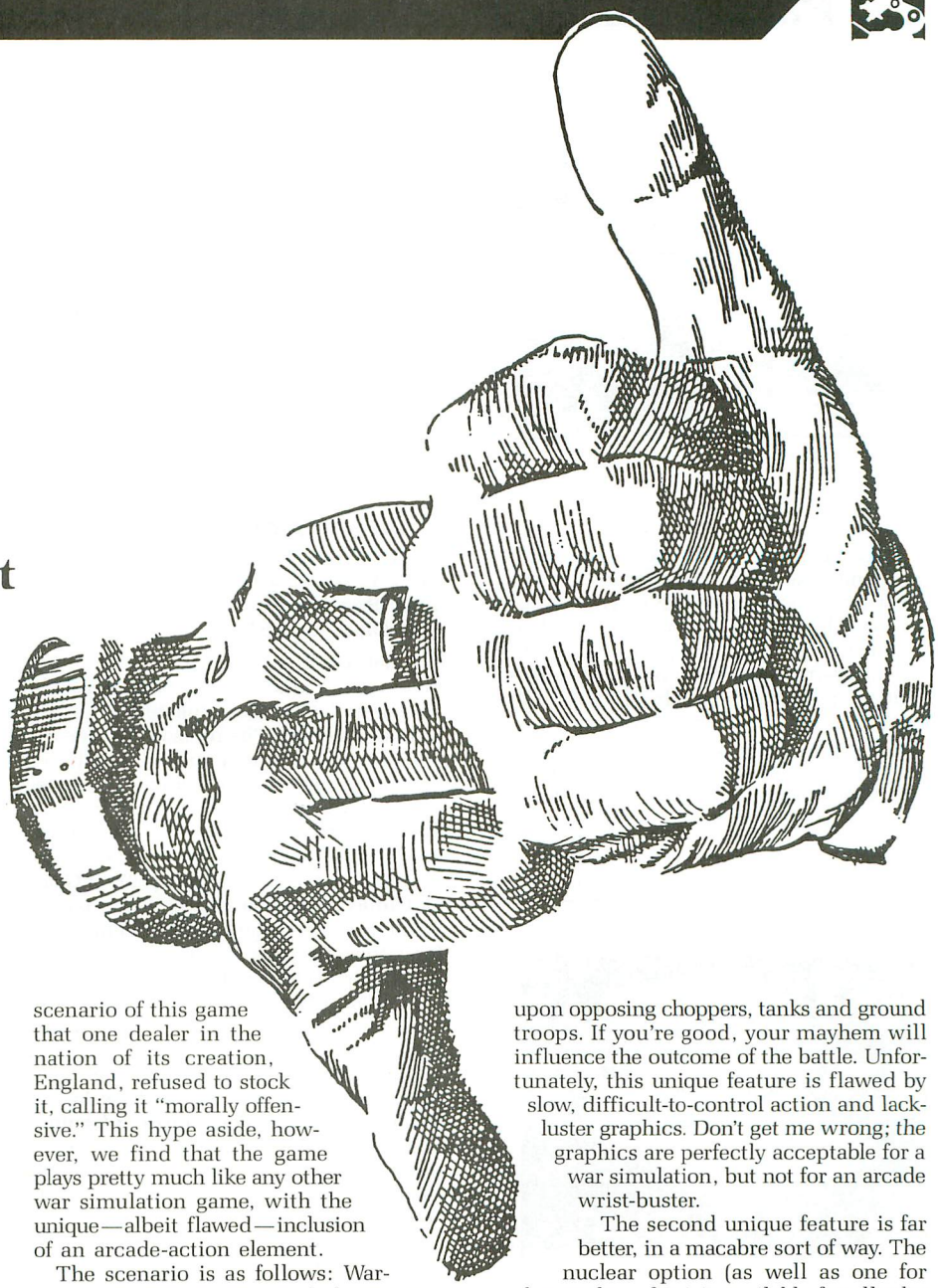


by Steve Panak

Well, spring is finally upon us, breaking the arctic chill which was no doubt responsible for keeping a lot of computers warm. Yes, the winter is a grand time for gaming, when the weather in most of the country is just perfect for curling up with a good game in a warm room. Any warm room. But before spring springs into view, take a look a couple of these gems. They just might be enough to keep you warm inside. And remember the old hacker's tale: if **Pac-Man** comes out of his cartridge slot and sees his shadow, we have six more weeks of gaming weather left.

I'm sure, if he saw any of these games, he wouldn't miss spring at all.

Theatre Europe

DATASOFT/INTELLICREATIONS, INC.
19808 Nordhoff Place
Chatsworth, CA 91311
48K Disk $34.95

In our current nuclear age, apocalyptic paranoia is practically glamorized. In the motion pictures, in print, everywhere one turns, there's adventure and excitement. Sometimes even romance. It's quite a contrast with the nuclear-winter realism scientists preach. This popular denial attitude is more or less blasted into neutrons by the newest game from Intellicreations.

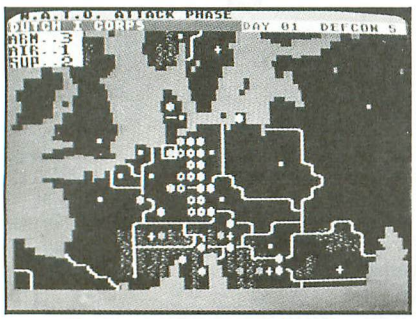
Theatre Europe is the game, but it's also the experience and tension of the tactical nuclear battlefield, which encompasses (as you'll soon find out) the entire world. And with that much at stake, you'd darned well better be up to it. In fact, so chilling is the scenario of this game that one dealer in the nation of its creation, England, refused to stock it, calling it "morally offensive." This hype aside, however, we find that the game plays pretty much like any other war simulation game, with the unique—albeit flawed—inclusion of an arcade-action element.

The scenario is as follows: Warsaw Pact armies have invaded West Germany. Their goal is to take over Europe. NATO forces must try to push the Reds back, and, failing that, nuke them out of existence. The screen display follows standard simulation format, depicting a map with enemy and friendly units represented by distinct icons. Passing the cursor over an icon displays, in a window, troop statistics, such as strength and firepower. Messages highlighting the progress of the game flash across the top of the screen. Play progresses in phases, during which you battle, rest and resupply troops. Even though the format is familiar to all but the simulation newcomer, two additional features make this game unique.

The first is an arcade-action battle resolution option, in which you control your attack against enemy targets. After choosing a battle to join into, you control fire upon opposing choppers, tanks and ground troops. If you're good, your mayhem will influence the outcome of the battle. Unfortunately, this unique feature is flawed by slow, difficult-to-control action and lackluster graphics. Don't get me wrong; the graphics are perfectly acceptable for a war simulation, but not for an arcade wrist-buster.

The second unique feature is far better, in a macabre sort of way. The nuclear option (as well as one for chemical warfare) is available for all who wish it. A number of launch scenarios are at hand, including a tactical strike and "Operation Warm Puppy," which empties all silos. These options are numbing in their implications, as is the telephone message you hear when you dial the secret number to obtain the code word necessary to launch your eggs. Unfortunately, the on-screen detonations are limited by the graphics, but the end results are limited only by your imagination.

Other options allow you to play either side, with the computer taking command of the opposition. Three levels increase the difficulty, by reducing the amount of information you, the armchair general, receive. Finally, you can choose whether or not to utilize the action screens, and you can save and restore games in progress. The joystick controls most of the action



Theatre Europe — **may the reality never approach.**

smoothly, and the screen map is highly detailed and easily interpreted.

Documentation consists of a manual, a map and a newspaper which sets a scenario of world tension on the verge of detonation. The manual is more complete than I expected, with full instructions on playing the game, as well as historical information and a bibliography. Indeed, the entire package was a pleasant surprise—the only drawback was the slip of paper that held special instructions applicable to the Atari version. It looks so insignificant that I think it likely many users will toss it out with the other marketing schlock.

Overall, **Theatre Europe** is an interesting game, with a couple of unique features. The arcade-action portion is an alpha test version of what I feel (and hope) will become a part of future simulations. The phone message, while long-distance for most people, is not quite far enough away for me. **Theatre Europe** explores the frightening plot of global thermonuclear war in such a realistic manner as to make all rational people hope the threat never comes closer to reality than this version on the silver screen.

Golden Oldies

by Software Country
ELECTRONIC ARTS
1820 San Mateo, CA 94404
48K Disk $29.95

When dealing with an industry of the rapid growth and obsolescence inherent in computer technology, one tends to lose sight of its birth. The roots of the tree are invisible to those high up in the limbs. In the ten years during which computer games have entertained us, another generation has arrived, asking how it all began. Well, we finally have the answer.

Volume I (implying a Volume 2?) of **Golden Oldies** is just that answer. Here, assembled for the first time, are the programs our forefathers first handed down to the masses, hooking them on the fantastic glowing phosphor tube. Some of you might not even remember the names, or the games themselves, but their effects have shaped, and will shape, generations to come. **Golden Oldies** brings us four of these larval-stage video games: **Pong, Eliza, Adventure** and **Life**. While the latter three were, for the most part, only seen by computer enthusiasts of ten years ago, the first game started it all.

Pong, the game that built Atari, is amply represented by both an original and an updated version. For those who don't remember **Pong**, the game was simply a video-ized version of ping-pong. But its moving, glowing dot hypnotized a country into making it the largest electronic game to date. It's simple enough—move the paddles to return the ball to the other side of the net, against either a human or computer opponent. The legend "Avoid missing ball for a high score" says it all. We had never seen anything like it before. Control in this game, as well as in all of the others, is good, and the graphics are just as I remembered them—simple and crisp. You can efficiently reach each program from a main menu which is always accessible via the ESCAPE key.

The other games are **Adventure**, the first text adventure game to respond to simple English; **Eliza**, an electronic psychotherapist (for amusement purposes only); and **Life**, a hypnotizing exhibition of random growth and death. Of these three games, the latter is the one I like the best. Using a few simple rules, generation upon generation of colored-light creatures appear and disappear before your eyes. By defining the initial population, you determine how future generations will behave. Their resulting growth and death is a hypnotizing kaleidoscopic color show. I found **Adventure** to be too simplistic an adventure game for my tastes, and **Eliza**, while entertaining, simply kept throwing the same responses back at me. I was quickly bored.

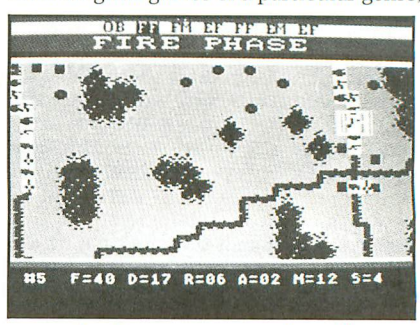
All these games are simple, born into a world where 2K was the *limit. You won't* be stunned by incredible graphics or vast vocabularies. If these are what you're looking for, you'll surely be disappointed. What this product does is document the creation of the first computer games by the pioneers, and you'll be awestruck by stories of the men who laid the groundwork for the worlds you play in now.

The superb documentation contains excerpts from a number of works, chronicling how and when these games were created. It is in these pages that the package truly shines—as a reference work of the creation of one of the milestones in human entertainment. From the birth of Atari to the halls and corridors of some of our largest corporations, you'll read the stories of the first computer hackers, a new breed who broke the rules to bring us games. If you're interested in researching and reliving this portion of our recent history, **Golden Oldies** is a rich vein to tap.

Wargame Construction Set

by Roger Damon
SSI
1046 North Rengstorff Avenue
Mountain View, CA 94043
48K Disk $29.95

Among my favorite programs are those which allow their owners to create games. Whether this be through the use of modifying options which change the play parameters of an arcade classic, or, as in this particular program, through the use of an editor-type program which allows you to build original games of a particular genre,



Create your own scenarios with *Wargame Construction Set.*

these programs are especially deserving of an honorable mention because they ignite the spark of ingenuity in all of us. They allow us to create.

Wargame Construction Set allows you to design, then play, a limitless number of war simulations. Coming from SSI, the king of the genre, the program helps you build simulations so much like the company's regular products that I wondered whether they might just be making public the program they use to whip up such treats as **NAM** and **Gettysburg: The Turning Point**.

As the leader in the simulation field, SSI has had years to perfect their format, and this new program follows their familiar "phase" method of play. In these phases, you and the enemy observe, move and fire. Additional phases score your performance and allow you to save your game position. One person may play against the computer, or two may compete against each other (a rather unique feature among simulation programs). Regardless of how many join in (even teams could participate), play progresses in pretty much the same way, with unnecessary phases no longer being available.

The most impressive portion of this program is the editor. Using it, you first design a map, with roads, woods and mines. Then you color it, adding trees, hills and water. Finally, you add enemy and friendly units, as well as setting their strengths, weaknesses and starting positions. In creating two opposing forces, a surprising number of variables are supported. You may have up to thirty-one units on each side. Each is designated a particular type (such as infantry or tank) and given the desired armaments. A duplication feature speeds creation of similar units, and enemy units are given an aggression factor to control how furiously they fight. Though it's very time-consuming to build a scenario, enough variables are present to allow creation of any type of confrontation.

The game also comes with eight predesigned simulations on a separate scenario disk. The novice simulator can begin right away on one of these, learning what goes into the simulation. Similarly, impatient players can sink their fangs into something as soon as they open the box. Scenarios range from World War II battles to castle sieges in the Middle Ages, to battles on asteroids in the distant future.

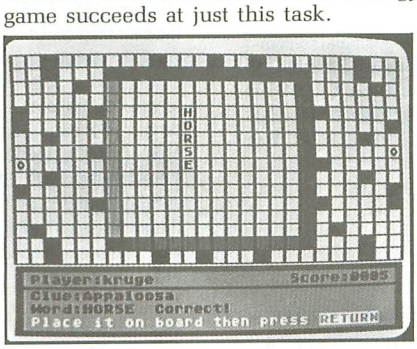
The manual lives up to SSI's legendary high standards. Its 28 pages thoroughly document both the intricacies of the editor and the eight scenarios, in an easy-to-read and completely indexed manner. Also included are various design hints, comments and guidelines. This complete Atari manual eliminates the need for a separate reference card. Control is set up very nicely, with the joystick and the three console keys (START, SELECT and OPTION) controlling most of the action. It's always a relief to not have to use the alphanumeric keys too frequently in a game.

Overall, I can heartily recommend this program for a number of markets. First, hard core simulators (if that's what you're known as) are going to want its editor feature. Also, newcomers to simulations might like it, as it offers, in simple terms, the full range and essence of simulation—that of recreating reality. Any battle that ever existed, or that you can imagine might exist, can be created with this powerful program. **Wargame Construction Set** is built to last and could be a cornerstone to a superb simulation library.

Crosscheck

by Tom McWilliams
DATASOFT/INTELLICREATIONS, INC.
19808 Nordhoff Place
Chatsworth, CA 91311
48K Disk $29.95

It's always refreshing to see a game that is based on an original concept—one that creates a gaming experience unmatched by any before it. And, once you have a good concept, it's generally much easier to make the game, too, because you need not try to set yourself apart from all the other adventures. DataSoft's newest word-strategy game succeeds at just this task.



Crosscheck — **an original idea.**

Crosscheck is a strategy crossword game for the entire family. It seamlessly merges a crossword puzzle and the old game of Twixt, the object of which is to build an unbroken barrier joining two areas.

After names of up to four players have been entered, each takes turns at placing words on the huge crossword board. A die rolls, and each player presses the SPACE BAR to stop it on a number from one to ten. If a three through a ten is rolled, then a clue is given, and the player must guess a word having the number of letters rolled. If correct, he places that word anywhere on the board. If a one is rolled, he places a block on the board. Rolling a two allows him to place a letter.

The game can be played with one of three objectives. You can play until you connect your two areas. You can also play to a set number of points, or for a given amount of time. In point-oriented games, 5 points are awarded for a correct guess, plus 1 point for each letter in the word. Connecting boundaries earns a 100-point bonus. You can choose to play with the joystick or keyboard; you can save games in progress; and you can purchase supplemental clue libraries (at $14.95 each), should you become familiar with all the clues on the disk. Clues span the range of difficulty, to let all of the family enjoy this stimulating game.

Some clue examples: *3 letters - Noah's boat (Ark); 10 letters - University president (Chancellor)*. Should you type a synonym or alternate spelling with the same number of letters, you're prompted to consult a dictionary and issue a ruling. Once the correct word is guessed, you use the joystick to place it on the board. You can connect it to a previously placed word (yours or the opponen'ts, as a strategic block), or place it anywhere on the board. Place it on a bonus square and get another guess.

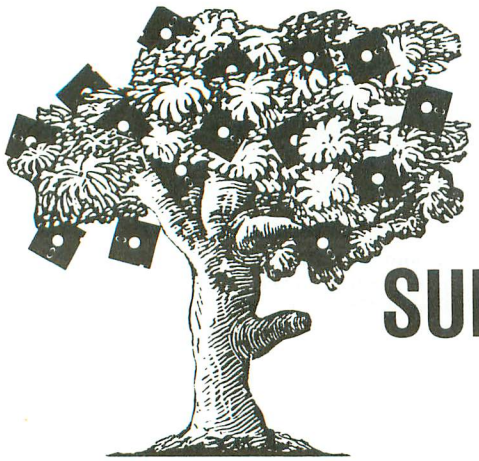
The huge diamond-shaped board becomes visible by tapping the "overview" key. Then, using the joystick, you move a box over the area you wish to magnify. This feature works similarly to the magnifying option on many drawing programs. All commands are easily issued with the joystick, and you can quickly move and rotate your word into the precise position you want. Although stick input is simplest, cursor keys may also be used.

The only drawbacks of the game were the simplicity of the clues, the frequent disk accesses required and the necessity to use the keyboard, rather than somehow using the stick for all input (perhaps moving the stick could have changed the letters on the solution line, and pressing the button could complete word selection). Also, although up to four may play, only one stick can be used. The manual is slight but complete, and includes strategies for successful play. A reference card contains machine-specific information.

Overall, **Crosscheck** receives a respectable rating. It combines originality with good programming, to produce a challenging and enjoyable game for the whole family. Check out **Crosscheck** —you won't be able to find words to describe it.

That's a wrap. Although there's something for everyone here, I think my favorite is **Crosscheck**. Still, **Golden Oldies** is a historical reference I think every serious computer buff should include in his library. Next month, some great games which begin with the letter *m*: **Mail Order Monsters** from Electronic Arts and **Moonmist** from Infocom.

The author wishes to thank the Magic One Computer Shop of Barberton, Ohio for their invaluable assistance in the creation of this chronicle.



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Midas Maze

Your magnetic Gold Grabber will help you in this Action! quest for the gold.

by Ken Miller

You are a Midian and are about to become a player in a robotic car chase contest. The goal: to gather as much gold as you can with your remote-controlled GII (Gold Grabber), a magnetically powered vehicle.

This would be fine, except that the Midian Guardian Squad has decided four RIIs (Ramdom Rovers) should roam around the gold vault room, making your goal more difficult. And that's not all. The RIIs have GII sensors built in. So, if they're within range of your vehicle, you can expect to be the object of a chase.

Luckily, there are six gold-transforming objects placed at various locations on the board. For a few seconds, they enable you to spin any and all RIIs, thus sending them back to their holding station. Even when the RIIs come back again, still golden colored, you may spin them once more.

Hitting the gold-transforming objects awards you various points, depending upon the object. Gas cans gain you 100 points, wax cans 200, dynamite 300, oil cans 400 and tacks 500.

But remember, this transforming power is given to you for only a short period of time. Use it wisely, either to pick up more gold coins (100 points), or to try to hit as many RIIs as you can.

You will also find that many of the corridors are blocked by vault doors. To open these doors, you must find the proper keys (100) for each.

The Guardians have also seen to it that, after you've gathered a certain amount of gold, a money bag will appear on-screen. The money bag's value starts at 1,000 and increases by 1,000 points each board, until it reaches 5,000—at which time it returns to 1,000 and starts all over again.

For every 10,000 points gained, the Guardians will award you with another GII vehicle to smash up.

The speed of both your GII and the Guardians' RIIs will increase on every board, making the game more difficult. If the action gets too hot for you, a touch of any key will pause and unpause the game.

*Ken Miller taught himself programming with the help of various books and magazines (**ANALOG Computing** mostly) and has been at it for about five years, off and on. His languages of choice are BASIC, Action! and machine language.*

(Listing starts on next page.)

Listing 1.
Action! listing.

```
;MIDAS MAZE.
 MODULE

;       CHECKSUM DATA
;[61 4F 6D B9 C9 38 9B 37
; 98 6A D4 94 37 3C E1 CC
; 66 F4 71 86 25 4D C2 DA
; C8 DD 8E 0C F2 7E 60 C4
; B0 C6 A0 DB EB 75 E1 2E
; CD BA 0D 76 60 2A 9B CE
; AC ]

;Your car's shape table.
; This holds the 4 direction
; positions and each of them has 3
; animation shapes to them
BYTE ARRAY P0=[
 16 186 186 40 56 186 186 0
 16 56 186 40 56 186 56 0
 16 186 56 40 56 56 186 0
 0 186 186 56 40 186 186 16
 0 56 186 56 40 186 56 16
 0 186 56 56 40 56 186 16
 102 0 126 238 126 0 102 0
 36 0 126 238 126 0 36 0
 66 0 126 238 126 0 66 0
 102 0 126 119 126 0 102 0
 36 0 126 119 126 0 36 0
 66 0 126 119 126 0 66 0 ],

; Enemy car shape table.
; Has the same as your car but
; different shape style
 EP=[
  189 189 36 60 60 165 189 36
  60 189 36 60 60 165 60 36
  189 60 36 60 60 36 189 36
  36 189 165 60 60 36 189 189
  36 60 165 60 60 36 189 60
  36 189 36 60 60 36 60 189
  198 0 255 218 218 255 0 130
  68 0 255 218 218 255 0 68
  130 0 255 218 218 255 0 130
  99 0 255 91 91 255 0 99
  34 0 255 91 91 255 0 34
  65 0 255 91 91 255 0 99],

; Character set data.
 CHST=[
  0 0 3 15 15 3 0 0
  0 0 0 192 192 0 0 0
  15 48 192 192 192 48 15 0
  192 48 12 12 12 48 192 0
  48 48 204 204 204 48 48 0
  255 0 0 0 0 0 255 0
  204 204 204 204 204 48 48 0
  48 48 204 204 204 204 204 204
  204 204 204 204 204 204 204 204
  192 192 192 192 192 192 192 192
  12 12 12 12 12 12 12 12
  0 0 0 0 0 0 255 0
  255 0 0 0 0 0 0 0
  192 192 192 192 192 48 15 0
  12 12 12 12 12 48 192 0
  192 48 12 12 12 12 12 12
  15 48 192 192 192 192 192 192
  0 51 0 63 51 63 0 51
  0 0 0 85 0 0 0 0
  0 0 0 84 0 0 0 0
  16 16 16 16 16 16 16 0
  3 12 8 15 15 15 15 15
  192 240 240 240 240 240 240 240
  0 5 21 42 41 37 41 42
  0 80 84 168 104 88 104 168
  0 0 63 63 63 0 0 0
  0 0 240 245 240 0 0 0
  0 107 106 106 106 106 106 0
  0 253 253 253 189 189 173 0
  10 42 1 1 1 1 1 1
  128 144 0 0 0 0 0 0
  0 48 204 205 204 48 0 0
  0 0 0 84 16 0 0 0
  0 0 0 0 0 0 0 0
  51 15 12 60 252 255 60 15
  48 252 48 252 63 63 60 240],

; X & Y Positions for different
; screen objects.
; Horizontal walls.
 PRL=[
  3 1 18 1 3 23 18 23 0 11 3 11 0
  13 3 13 9 4 18 4 9 11 15 11 12 7 15
  7 18 7 21 7 9 13 15 13 12 15 15 15
  40],

; Vertical walls.
 PUD=[
  3 1 3 11 3 13 3 23 6 3 6 11 6
  13 6 21 9 6 9 11 15 7 15 11 18 7 18
  11 9 13 9 21 12 15 12 21 18 13 18
  15 18 17 18 21 15 17 15 21 40],

; White doors.
 DOOR=[
  3 12 15 14 10 7 19 1 10 21 16
  17 16 21 19 23 19 11],

; Energizers.
 ENER=[
  10 14 16 19 4 7 28 14 22 19 34 7],
 KEYS=[7 4 19 4 31 4 16 9 22 9
  7 17 31 17 19 14],
 SPNA=[0 3 1 2],SCR,DLIST,T8M(12),
 T3M(6),ST=632,PCOLR=704,HPOSP=53248,
 HPOSM=53252,SIZEP=53256,MPL=53256,
 AUDFC=53760,PARY,SH,SCOR(8),SC,
 STX(5),STY(5),ODR(5),OSX(5),OSY(5),
 CSX(5),CSY(5),CDX(5),CDY(5),SAX(5),
 SAY(5),BRPO(5),DIR(5),DDU(5),DDD(5),
 DDL(5),DDR(5),EH(5),EDF(4),PDF(5),
 SPT(5),SPIN(5),SPN(5),ECT(4)
CARD ARRAY Y40(24),PAD(5)
CARD CHSET,DL,CLP0,PMTEMP,M0,PL0,PL1,
PL2,PL3,SHAD,GC,GG,POWER=[0],DELAY,
MBT
BYTE P106,LP0,LP1,R,PLX,PLY,DRX,DRY,
P0X,P0Y,P1X,P1Y,TALL,IC,S,S0,S1,PMTL,
SP=[2],PMNO,DI,T50,T51,T52,T53,STIK,
DCD,DCD0
BYTE
 DDM,PMM,TM,SP1,P0,LB,SP0,ST0,ST1,
 ST2,ST3,COL=[0],PT=[0],PD=[0],SSC,
 XTRA=[3],OSCOR=[0],ESC=[2],ELP,SES,
 MEM,INE=[0],THO=[1]

; OS or HARDWARE locations.
BYTE RTCLOK=18,ATRACT=77,RAMTOP=106,
 SDMCTL=559,GRPRIOR=623,STRIG0=644,
 CHBAS=756,CH=764,PFCOLR2=53272,
 P0C=53260,GRACTL=53277,HITCLR=53278,
 CONSOL=53279,AUDCTL=53768,
 PMBASE=54279,WSYNC=54282,
 VCOUNT=54283

; Prints score
PROC PRSCOR()
 FOR SP0=0 TO 7 DO
  SCR(10+SP0)=SCOR(SP0)+16
 OD
RETURN

; Check for digit overflow
```

```
PROC SCLP()
 LB=8
 FOR SP1=0 TO 7 DO
  LB==-1 PO=SCOR(LB)
  IF PO>9 THEN
   SCOR(LB)=SCOR(LB)-10
   SCOR(LB-1)=SCOR(LB-1)+1
  FI
 OD
RETURN

; Takes the variable ADD and adds
; it to your score.
PROC SCORE(BYTE ADD)
 IF ADD>0 THEN
  ADD==-1
  FOR SP0=0 TO ADD DO
   SCOR(7)=SCOR(7)+1
   SCLP() ;up date score.
  OD
 FI
 PRSCOR() ;Print it.
RETURN

; Adds TH to the thousands position.
PROC THOUS(BYTE TH)
 SCOR(4)==+TH
 SCLP()
 PRSCOR()
RETURN

; Adds HD to hundreds pos.
PROC HUND(BYTE HD)
 SCOR(5)==+HD
 SCLP()
 PRSCOR()
RETURN

; Plot ON the screen.
PROC PL(BYTE PX,PY)
 PLX=PX PLY=PY
 SCR(PLX+Y40(PLY))=IC ;Access screen.
RETURN

; Draw characters on screen
; in horizontal or vertical lines.
PROC DR(BYTE DX,DY)
 DRX=DX DRY=DY
 ;Find out which is greater
 ; the plot or the drawto x position.
 IF PLX<>DRX THEN
  IF PLX>DRX THEN
   S0=DRX S1=PLX
  ELSE
   S0=PLX S1=DRX
  FI
  IF IC=70 THEN
   SCR(S0+Y40(DRY))=67
   SCR(S1+Y40(DRY))=68
   S0==+1 S1==-1
  FI
  FOR S=S0 TO S1 DO
   SCR(S+Y40(DRY))=IC
  OD
 FI
 ;Find out the greater y position.
 IF PLY<>DRY THEN
  IF PLY>DRY THEN
   S0=DRY S1=PLY
  ELSE
   S0=PLY S1=DRY
  FI
  IF IC=73 THEN
   SCR(PLX+Y40(S0))=72
   SCR(PLX+Y40(S1))=71
   TS0=SCR(DRX+1+Y40(S0))
   TS2=SCR(DRX-1+Y40(S0))
   ;Check for intersecting line and
   ;add corners when needed.
   IF TS0=70 THEN
    SCR(DRX+Y40(S0))=81
   FI
   IF TS2=70 THEN
    SCR(DRX+Y40(S0))=80
   FI
   TS1=SCR(DRX+1+Y40(S1))
   TS2=SCR(DRX-1+Y40(S1))
   IF TS1=70 THEN
    SCR(DRX+Y40(S1))=78
   FI
   IF TS2=70 THEN
    SCR(DRX+Y40(S1))=79
   FI
   S0==+1 S1==-1
  FI
  FOR S=S0 TO S1 DO
   SCR(DRX+Y40(S))=IC ;Plot character
  OD                  ;on screen.
 FI
 ;Save drawto's values in plx and
 ; ply variable for next drawto.
 PLX=DRX PLY=DRY
RETURN

;Set-up player address and shape
;address and direction for PM_GO proc.
PROC PMST(CARD PMADR,SHADR,D)
 ;Make array pary point to the
 ;players ram area.
 PARY=PMADR TM=T3M(D)
 SHAD=SHADR DI=T8M(TM)
 ;Check to see if Player is player or
 ;missile shapes.
 IF PMADR>M0 THEN
  PMNO=((PMADR-PMTEMP-1024))  RSH 8
 ELSE
  PMNO=4
 FI
RETURN

;Puts the player or missile shape in
;the P/M memory area give it's y pos.
;and pokes it's horizontal position
;reg.
PROC PM_GO(BYTE PMX,PMY,FR)
 IF PMNO<4 THEN
  HPOSP(PMNO)=PMX
 ELSEIF PMNO=4 THEN
;If it's missiles move them all as 1.
  HPOSP(PMNO)=PMX+6
  HPOSP(PMNO+1)=PMX+4
  HPOSP(PMNO+2)=PMX+2
  HPOSP(PMNO+3)=PMX
 FI
 ;Shape table index using animation
 ;frame variable plus direction var.
 SH=SHAD+((T8M(FR))+DI)
 ;This loop erases as many bytes
 ;ahead and behind the P/M shapes as
 ;the variable SP's value.
 FOR TALL=0 TO SP DO
  PARY((PMY-SP)+TALL)=0
  PARY((PMY+7)+TALL)=0
 OD
 ;takes the data from the shape table
 ;and puts it in player ram.
 FOR TALL=0 TO 7  DO
  PARY(PMY+TALL)=SH(TALL)
 OD
RETURN

;Set up different variables that
;have to do with screen position
;of the player compared with the
;characters on the maze
PROC VARSET(BYTE VN)
```

```
  OSX(VN)=STX(VN)    ;Make old X&Y pos.
  OSY(VN)=STY(VN)    ;= new X&Y pos.
  ODR(VN)=DIR(VN) ;old direction = new
  CSX(VN)=STX(VN)-48 ;Make P/M x&y =
  CSY(VN)=STY(VN)-32 ;that of screen.
  SAX(VN)=CSX(VN)&3 ;Checks for even
  SAY(VN)=CSY(VN)&7 ;char. pos.
  CDX(VN)=CSX(VN)/4 ;Divide to find
  CDY(VN)=CSY(VN)/8 ;char. we're over.
RETURN

;Checks to see what type of
;character we hit and what to do
;about it.
PROC LOOK()
 BYTE K0,K1,KP
 IF STX(4)>52 AND STX(4)<192 THEN
  DCD=SCR(CDX(4)+Y40(CDY(4)))
  DCD0=SCR(CDX(4)+1+Y40(CDY(4)))
  ;Check to see if char. is Gold.
  IF DCD=193 THEN
   SCR(CDX(4)+Y40(CDY(4)))=0
   SCR(CDX(4)+1+Y40(CDY(4)))=0
   GG==+1 ;increase gold count.
   ST0=10 ;sound effects timer.
   SCORE(5) ;Add 5 points to score.
  FI
  ;Check to see if it's an energizer.
  IF DCD=86+INE THEN
   ;Compare your position with that
   ;of the enegizer position table.
   FOR LP0=0 TO 12 STEP 2 DO
    K0=ENER(LP0) K1=ENER(LP0+1)
    ;If it's a match the erase it.
    IF K0=CDX(4) AND K1=CDY(4) THEN
     IC=98
     PL(CDX(4),CDY(4))
     PL(CDX(4)+1,CDY(4))
    FI
   OD
   KP=LP0 HUND((INE RSH 1)+1)
   POWER=100 ;Set power timer.
  ST3=60 PT=60 PD=5
  FOR LP0=0 TO 3 DO
   ECT(LP0)=80
  OD
 FI
 ;See if it's a key.
 IF DCD=96 THEN
  ;Scan key pos. table and see if
  ;ours matches the keys.
  FOR LP0=0 TO 16 STEP 2 DO
   K0=KEYS(LP0)
   K1=KEYS(LP0+1)
   IF K0=CDX(4) AND K1=CDY(4) THEN
    IC=98
    PL(CDX(4),CDY(4))
    PL(CDX(4)+1,CDY(4))
    KP=LP0 ;Make KP=LP0 so we can
           ;use it to index the
           ;door array.
    HUND(1) ;Add 1 hundred to score.
    ST2=20
   FI
  OD
  ;Find out if it'S a vertical or
```

```
    ;horizontal door and erase it.
    IF KP<4 THEN
     IC=98 PL(DOOR(KP),DOOR(KP+1))
     PL(39-DOOR(KP),DOOR(KP+1))
    ELSE
     IC=98 PL(DOOR(KP),DOOR(KP+1))
     PL(DOOR(KP)+1,DOOR(KP+1))
     PL(38-DOOR(KP),DOOR(KP+1))
     PL(38-DOOR(KP)+1,DOOR(KP+1))
    FI
   FI
  FI
  ;Find out if it's the money bag.
  IF DCD=99 THEN IC=98
   PL(CDX(4),CDY(4))
   THOUS(THO) ;Add thousands to score.
   PL(CDX(4)+1,CDY(4)) ST2=30
  FI
RETURN

;Check to see if it's legal to move
;in the direction chosen.
PROC CHCH(BYTE CN)
;CN is the P/M number.
 BYTE BPAS,BPAS2
 ;Checks to see if player shape is
 ;evenly placed over a character.
 IF SAY(CN)=0 AND SAX(CN)=0 THEN
  ;Set all direction vars. to 0.
  DDU(CN)=0 DDD(CN)=0
  DDL(CN)=0 DDR(CN)=0
  DDM=0 EH(CN)=0
  ;Checks P1. up direction for walls.
  DCD=SCR(CDX(CN)+Y40(CDY(CN)-1))
  DCD0=SCR(CDX(CN)+1+Y40(CDY(CN)-1))
  IF DCD>66 AND DCD<86
  OR DCD0>66 AND DCD0<86 THEN
   DDU(CN)=1
  FI
  ;Check down
  DCD=SCR(CDX(CN)+Y40(CDY(CN)+1))
  DCD0=SCR(CDX(CN)+1+Y40(CDY(CN)+1))
  IF DCD>66 AND DCD<86
  OR DCD0>66 AND DCD0<86 THEN
   DDD(CN)=1
  FI
  ;Checks left.
  DCD=SCR(CDX(CN)-1+Y40(CDY(CN)))
  IF DCD>66 AND DCD<86 THEN
   DDL(CN)=1
  FI
  ;Check right.
  DCD=SCR(CDX(CN)+2+Y40(CDY(CN)))
  IF DCD>66 AND DCD<86 THEN
   DDR(CN)=1 FI
  ;If it's your car see what's under
  ;it.
  IF CN=4 THEN
   DCD=SCR(CDX(4)+Y40(CDY(4)))
   DCD0=SCR(CDX(4)+1+Y40(CDY(4)))
   ;See if it's more than just a
   ;blank area.
   IF DCD>0 AND DCD0>0 THEN
    DDM=1
   FI
  FI
 FI
 ;See if we're off screen.
 IF STX(CN)<30 THEN
  STX(CN)=220
 FI
 IF STX(CN)>220 THEN
  STX(CN)=30
 FI
 ;See if we entered horizontal
 ;tunnels ,and if so block from
 ;moving up or down.
 IF STX(CN)<56 OR STX(CN)>192 THEN
   DDU(CN)=1 DDD(CN)=1
   DDL(CN)=0 DDR(CN)=0
  FI
  ;See if we're in vertical.
  IF STY(CN)<48 OR STY(CN)>208 THEN
   DDL(CN)=1 DDR(CN)=1
  FI
   ;This bit of code tells us which
   ;directions we can go.
   IF DIR(CN)=0 AND DDU(CN)=1 THEN
    DIR(CN)=ODR(CN) EH(CN)=1
   FI
   IF DIR(CN)=1 AND DDD(CN)=1 THEN
    DIR(CN)=ODR(CN) EH(CN)=1
   FI
   IF DIR(CN)=2 AND DDL(CN)=1 THEN
    DIR(CN)=ODR(CN) EH(CN)=1
   FI
   IF DIR(CN)=3 AND DDR(CN)=1 THEN
    DIR(CN)=ODR(CN) EH(CN)=1
   FI
   ;This part moves P/M in the legal
   ;direction and is used to gain
   ;continues motion.
   ;with out it you would have to hold
   ;the joystick in that direction
   ;all the time to keep moving.
   IF DIR(CN)=0 AND DDU(CN)=0 THEN
    STY(CN)==-SP
   FI
   IF DIR(CN)=1 AND DDD(CN)=0 THEN
    STY(CN)=STY(CN)+SP
   FI
   IF DIR(CN)=2 AND DDL(CN)=0 THEN
    STX(CN)=STX(CN)-SP FI
   IF DIR(CN)=3 AND DDR(CN)=0 THEN
    STX(CN)=STX(CN)+SP FI
RETURN

;This part here takes each enemy
;player and gives him a place to go.
PROC EMBR(BYTE EN)
 BYTE R,D,FL,D0,D1
 FL=0 D=ODR(EN)
 D0=OSY(EN) D1=OSX(EN)
 VARSET(EN) ;Go set up P/M screen
            ;variables.
 ;Makes sure it'S directly over a
 ;character position.
 IF SAX(EN)=0 AND SAY(EN)=0 THEN
 ;Sees if your power off and if
 ;they are with in range of you.
 ;If they are then they follow you!
 IF POWER=0 AND STX(EN)>STX(4)
  AND STX(EN)<STX(4)+56 THEN
   DIR(EN)=2
  ELSEIF STX(EN)<STX(4)
  AND STX(EN)>STX(4)-48 THEN
   DIR(EN)=3
  ELSEIF STY(EN)>STX(4)
  AND STY(EN)<STY(4)+56 THEN
   DIR(EN)=0
  ELSEIF STY(EN)<STY(4)
  AND STY(EN)>STY(4)-48 THEN
   DIR(EN)=1
  ELSE
   ;If not then run random.
   R=RAND(4) DIR(EN)=R FI
  DO
   ;Check for legal movement.
   IF D=0 AND DIR(EN)=1 THEN FL=1
   ELSEIF D=1 AND DIR(EN)=0 THEN
    FL=1
   ELSEIF D=2 AND DIR(EN)=3 THEN
    FL=1
   ELSEIF D=3 AND DIR(EN)=2 THEN
    FL=1
   ELSE
```

```
    FL=0
   FI
   ;If illegal move get a new
   ;direction.
   IF FL=1 THEN
    R=RAND(4) DIR(EN)=R
   FI
  UNTIL FL=0
  OD
  IF STX(EN)=D1 AND STY(EN)=D0 THEN
   R=RAND(4) DIR(EN)=R
  FI
 FI
 CHCH(EN) ;Go check chraracter.
RETURN

INCLUDE "D:MIDAS2.ACT"

●
```

Listing 2.
Action! listing.

```
;       CHECKSUM DATA
;[EC 61 1B 36 B8 1C C8 1E
; 4C 34 CD 5E 3C 82 2A 56
; DF 77 62 ED 61 C7 5A 14
; 20 C1 6C 4F E9 2C D1 EB
; 6C 95 E1 84 AF 0B 1A 88
; 3B EE ]
```



```
;Checks joystick to see if you wish
;to change direction.
PROC STICK(BYTE PN)
 VARSET(4)
 ;Set atract to keep it off.
 IF ST(0)<>15 THEN
  ATRACT=0
  ;Only if x is evenly over a
  ;character position may you move
  ;up or down.
  IF SAX(4)=0 THEN
   ;Check for up movement.
   STIK=ST(0) & 1
   IF STIK = 0 THEN
    DIR(4)=0
   FI
   ;Checks for down.
   STIK=ST(0) & 2
   IF STIK=0 THEN
    DIR(4)=1
   FI
  FI
  ;Only if y postion even divided
  ;by 8 may you move left or right.
  IF SAY(4)=0 THEN
   ;Check for right.
   STIK=ST(0) & 8
   IF STIK=0 THEN
    DIR(4)=3
   FI
   ;For left.
   STIK=ST(0) & 4
   IF STIK=0 THEN
    DIR(4)=2
   FI
  FI
 FI
 CHCH(4) ;check for anything.
 IF DDM=1 AND PN=4 THEN
  LOOK() ;If not a wall then what?
 FI
RETURN

;Check for collision.
PROC CHCOL()
 BYTE COP
 COL=0
 FOR COP=0 TO 3 DO
  IF MPL(COP)>0 THEN COL=MPL(COP) FI
 OD
 HITCLR=0 ;clear collision reg.
RETURN

;Set-up mode 4.
PROC GR4()
 GRAPHICS(0) DLIST=PEEKC(560)
 POKE(752,1) PRINT(" ")
 ;Change display list.
 DLIST(3)=66
 FOR LP0=6 TO 28 DO
  DLIST(LP0)=4
 OD
 ;Set multiplication arrays.
 FOR LP0=0 TO 40 DO
  Y40(LP0)=LP0*40
 OD
 FOR LP0=0 TO 12 DO
  T8M(LP0)=LP0*8
 OD
 FOR LP0=0 TO 4 DO
  T3M(LP0)=LP0*3
 OD
RETURN
;Make room for char.set and P/M ram.
PROC CHSETUP()
 ;Push ram top pointer back 4K.
 P106=PEEK(106)-12 CHSET=P106*256
 RAMTOP=P106 GR4() CHBAS=P106
```

```
  ;Move rom char. set to ram.
  MOVEBLOCK(CHSET,57344,1024)
  ;Move custom char. data.
  FOR CLP0=0 TO 288-1 DO
   POKE((CHSET+520)+CLP0,CHST(CLP0))
  OD
  SCR=PEEKC(88) ;Find screen ram.
 RETURN

 ;Set-up P/M graphics
 PROC PM_SET()
  SDMCTL=62      ;Single line res.
  GRPRIOR=1+16   ;P/M over PF.
  GRACTL=3       ;Turn P/M on.
  ;Set size to small.
  FOR LP0=0 TO 3 DO
   SIZEP(LP0)=0
  OD
  ;Set variables to point to P/M ram.
  PMBASE=P106+4 PMTEMP=(P106+4)*256
  M0=PMTEMP+768 PL0=M0+256
  PL1=PL0+256 PL2=PL1+256 PL3=PL2+256
  ;Save addresses of player in PAD.
  PAD(0)=PL0 PAD(1)=PL1
  PAD(2)=PL2 PAD(3)=PL3
  ;Set players color reg.s.
  PCOLR(0)=0*16+10 ;White.
  PCOLR(1)=12*16+5 ;Green.
  PCOLR(2)=8*16+4  ;Blue.
  PCOLR(3)=4*16+4  ;Red.
  ;Zero out P/M area.
  ZERO(PMTEMP,2048)
 RETURN
 PROC PAUSE()
  POSITION(33,0) PRINT("PAUSED")
  FOR LP0=0 TO 7 DO ;Turn sound off.
   AUDFC(LP0)=0
  OD
  CH=255 ;Reset key scan.
  DO
  ;Till a key is pressed
  UNTIL CH<255 OD
  CH=255
  ;Erase pause message.
  POSITION(33,0) PRINT("      ")
 RETURN

 ;Take left side of screen and copy it
 ;to right side.
 PROC MIRROR()
  BYTE SC
  ;Left halfs 20 byte wide.
  FOR LP0=0 TO 19 DO
   ;24 bytes tall.
   FOR LP1=0 TO 23 DO
    SC=SCR(LP0+Y40(LP1))
    ;check for corner char.s and
    ;replace it with mirrored char.
    IF SC=78 OR SC=80 THEN SC==+1
    ELSEIF
    SC=79 OR SC=81 THEN SC==-1
    FI
    IF SC=67 THEN SC==+1
    ELSEIF SC=68 THEN SC==-1
    FI
    IF SC=83 THEN SC==+1
    ELSEIF SC=84 THEN SC==-1
    FI
    ;Put right side down.
    SCR((39-LP0)+Y40(LP1))=SC
   OD
  OD
 RETURN
 PROC BOARD5()
  IC=70 LP0=0
  P0X=PRL(LP0)
  ;Put walls up.
  WHILE P0X<40 DO
   ;Get values from arrays.
   P0Y=PRL(LP0+1)
   P1X=PRL(LP0+2) P1Y=PRL(LP0+3)
   PL(P0X,P0Y) DR(P1X,P1Y) LP0==+4
   P0X=PRL(LP0)
  OD
  IC=73 LP0=0 P0X=PUD(LP0)
  WHILE P0X<40 DO
   P0Y=PUD(LP0+1)
   P1X=PUD(LP0+2) P1Y=PUD(LP0+3)
   PL(P0X,P0Y) DR(P1X,P1Y) LP0==+4
   P0X=PUD(LP0)
  OD
   IC=69 PL(12,9)
   IC=98
   FOR LP0=0 TO 2 DO
    PL(LP0,1) DR(LP0,10)
    PL(LP0,14) DR(LP0,23)
   OD
   PL(0,12) DR(2,12) PL(19,8) DR(19,10)
   PL(10,8) PL(10,10) PL(12,14) IC=85
   ;Put up doors.
   FOR LP0=0 TO 4 STEP 2 DO
    P0X=DOOR(LP0) P0Y=DOOR(LP0+1)
    PL(P0X,P0Y)
   OD
   IC=84
   FOR LP0=4 TO 15 STEP 2 DO
    P0X=DOOR(LP0) P0Y=DOOR(LP0+1)
    IC=83 PL(P0X,P0Y)
    IC=84 PL(P0X+1,P0Y)
   OD
```

```
 MIRROR() ;Put it on the right side.
 FOR LP0=0 TO 10 DO ;Flash the walls.
  R=RAND(15)
  PCOLR(6)=R*16+8
  FOR CLP0=0 TO 3500 DO OD
 OD
 ;Place energizers on screen.
 FOR LP0=0 TO 11 STEP 2 DO
  P0X=ENER(LP0) P0Y=ENER(LP0+1)
  IC=86+INE PL(P0X,P0Y)
  IC=87+INE PL(P0X+1,P0Y)
 OD
 ;Set keys in place.
 FOR LP0=0 TO 15 STEP 2 DO
  P0X=KEYS(LP0) P0Y=KEYS(LP0+1)
  IC=96 PL(P0X,P0Y)
  IC=97 PL(P0X+1,P0Y)
 OD
 ;Fill maze with gold.
 FOR CLP0=40 TO 959 DO
  TS0=SCR(CLP0) TS1=SCR(CLP0+1)
  ;See if area open for gold coin.
  IF TS0=0 AND TS1=0 THEN
   SCR(CLP0)=193 SCR(CLP0+1)=194
   GC==+1
  FI
 OD
RETURN

;Put up title screen.
PROC TITLE()
 XTRA=3 OSCOR=0 SSC=5 COL=0 INE=0
 ;Remove player from screen.
 FOR LP0=0 TO 7 DO
  HPOSP(LP0)=0
 OD
 DELAY=700
 RAMTOP=MEM  ;Reset ram pointer.
 GRAPHICS(1)
 SETCOLOR(4,0,0) SETCOLOR(0,8,3)
 SETCOLOR(1,2,8)
 ;2 lines of GR.2.
 DLIST=PEEKC(560) DLIST(10)=7
 DLIST(11)=7
 POKE(752,1)
 SCR=PEEKC(88) ;Find screen ram.
 PRSCOR()
 POSITION(5,5) PRINTD (6,"MIDAS")
 POSITION(9,6) PRINTD(6,"MAZE")
 POSITION(2,14)
 PRINTDE(6," press FIRE or")
 PRINTD(6,"   START to PLAY") PUTE()
 PRINT("           by Ken Miller")
 SNDRST() ;Turn sound off.
 DO ;Scroll colors thru message.
  FOR LP0=0 TO 1 DO
   TS0=COL
   DO
    ;Keep in sync and increase color
    ;for every scan line.
    WSYNC=0 PFCOLR2=TS0 TS0==+1
   ;Until scans off screen
   UNTIL VCOUNT=128 OD
  OD
  COL==-1 ;Increase color value
  ;Do it until start or fire buttons
  ;pressed.
 UNTIL CONSOL=6 OR STRIG0=0 OD
 COL=0 TS0=0
 ;Clear score out.
 ZERO(SCOR,8) PRSCOR()
 ;Set-up P/M and char.set.
 CHSETUP()
 PM_SET()
 HITCLR=0 ;Clear collision reg.
RETURN
;Heres where the action starts.
PROC START()
BYTE R
DO
 SNDRST()
 GC=0 GG=0 ;GOLD COUNT VARIABLES.
 ;Put enemy in holding pen.
 FOR LP0=0 TO 3 DO
  STX(LP0)=124 STY(LP0)=96
 OD
 ;Put your car on screen.
 STX(4)=124 STY(4)=160 BRPO(1)=0
 ;clear screen and draw maze.
 ZERO(SCR,959) BOARDS()
 ;Put up extra cars.
 FOR LP0=0 TO XTRA-1 DO
  SCR(21+LP0)=82
 OD
 ZERO(M0,1279)
 SETCOLOR(0,0,14) SETCOLOR(1,8,10)
 SETCOLOR(2,3,5) SETCOLOR(3,2,8)
 SETCOLOR(4,0,0)
 ;Set your car going left.
 DIR(4)=2 SP=2
 ;Nulls spinning var.s.
 FOR LP0=0 TO 4 DO
  SPIN(LP0)=0 EDF(LP0)=0 PDF(LP0)=0
  SPT(LP0)=0 SPN(LP0)=0
 OD
 DO
  ;See if we want to pause.
  IF CH<255 THEN PAUSE() FI
  ;See if you get an extra car.
  IF SCOR(3)>OSCOR THEN
   OSCOR=SCOR(3) XTRA==+1
   SCR(21+(XTRA-1))=82
  FI
  IF SCOR(3)=0 THEN OSCOR=0 FI
  ;Sound effects time.
  IF ST0>0 THEN
   AUDFC(0)=ST0 AUDFC(1)=32+1
   ST0==-1 ;Decrease timer.
  ELSE AUDFC(1)=0 ;Shut sound down.
  FI
  IF ST2>0 THEN
   AUDFC(2)=10+ST2
   AUDFC(3)=128+64+2
   ST2==-1
  ELSE AUDFC(3)=0
  FI
  IF ST3>0 THEN
   AUDFC(4)=12+ST3 AUDFC(5)=64+32+2
   ST3==-1
  ELSE AUDFC(5)=0
  FI
  ;See if you cleared the maze.
  IF GC=GG THEN DELAY==-25
   IF DELAY<10 OR DELAY>700
   THEN DELAY=10
   FI
   INE==+2
   IF INE>8 THEN INE=0 FI
   ;Money bag bonus value.
   THO==+1
   IF THO>5 THEN THO=1 FI
   START() ;Do it again.
  FI
  ;Check to see if it's time for
  ;money bag, put it in the screen
  IF GG=75 THEN
   IC=99 PL(19,10)
   IC=100 PL(20,10)
   MBT=350 ;Money bag timer.
  FI
  IF MBT>0 THEN MBT==-1 FI
  ;Erase money bag.
  IF MBT=1 THEN
   IC=98 PL(19,10)
   PL(20,10)
  FI
```

```
 CHCOL() ;Check for collision.
 IF PT=0 THEN ESC=2 FI
 IF COL>0 THEN
  ;Make collision value into
  ;player number for ID.
  IF COL=8 THEN COL=3
  ELSE
   COL== RSH 1
  FI
  IF DIR(4)>1 THEN PDF(4)=1
  ELSE PDF(4)=0
  FI
  ;Clear player dead flag.
  IF DIR(COL)>1 THEN PDF(COL)=1
  ELSE
   PDF(COL)=0
  FI
  ;See if you have gold power.
  IF POWER>0 OR PT>0 THEN
   ;Set dead flag timer.
   IF EDF(COL)=0 THEN EDF(COL)=80
    ;Give your points for enemy.
    IF EDF(COL)=80 THEN
     FOR ELP=1 TO ESC DO
      HUND(1)
     OD
     ESC==+1 ;increase bonus value
    FI
    IF ESC>16 THEN ESC=8 FI
   FI
  ;See if your dead.
  ELSEIF PDF(4)=PDF(COL)
  AND EDF(COL)=0 THEN
   ZERO(M0,1279) PMM=0
   ;Set enmy back to garage.
   FOR LP0=0 TO 3 DO
    STX(LP0)=124 STY(LP0)=96
   OD
   SNDRST()
   ;Spin your car.
   FOR CLP0=0 TO 500 DO
    SPT(4)==+1
    IF SPT(4)>SPN(4) RSH 3 THEN
     SPT(4)=0 SPN(4)==+6
     IF SPN(4)>250 THEN SPN(4)=0 FI
     SPIN(4)==+1
     IF SPIN(4)>3 THEN SPIN(4)=0 FI
    FI
    ;Put player on screen.
    PMST(M0,P0,SPIN(4))
    PM_GO(STX(4),STY(4),PMM)
    ;Spinning sound effects.
    AUDFC(6)=SPIN(4) LSH 4
    AUDFC(7)=2
    FOR LP0=0 TO 200 DO OD
   OD
   ;Reset variables
   AUDFC(6)=0 AUDFC(7)=0 SPT(4)=0
   SPN(4)=0 ZERO(M0,255) DIR(4)=2
   ;Put your car in maze again.
   STX(4)=124 STY(4)=160 COL=0
   PMST(M0,P0,DIR(4))
   PM_GO(STX(4),STY(4),PMM)
   FOR CLP0=0 TO 40000 DO OD
   ;Decrease extra cars.
   SCR(21+(XTRA-1))=0 XTRA==-1
   ;all gone?.
   IF XTRA=0 THEN TITLE() START()
   FI
  FI
 FI
 COL=0
 ;See if enemy gets spun
 IF POWER>0 THEN POWER==-1
  ;Make their cars gold
  FOR LP0=0 TO 3 DO
   PCOLR(LP0)=2*16+6
  OD
  ;Flash their color before
  ;returning them to regular state.
  ELSEIF PT>0 THEN PT==-1 PD==-1
   FOR LP0=0 TO 3 DO
    PCOLR(LP0)=2*16+6
   OD
   IF PD>200 THEN PD=5
    PCOLR(0)=0*16+10
    PCOLR(1)=12*16+5
    PCOLR(2)=8*16+4 PCOLR(3)=4*16+4
   FI
  FI
  ;Move enemy players
  FOR LP0=0 TO 3 DO
   ;See if enemys alive
   IF EDF(LP0)=0 THEN
    EMBR(LP0)
    PMST(PAD(LP0),EP,DIR(LP0))
    PM_GO(STX(LP0),STY(LP0),PMM)
   ELSE
    ;Nah their dead,spin them.
    EDF(LP0)==-1 SPT(LP0)==+1
    IF EDF(LP0)>2 THEN
     IF SPT(LP0)>SPN(LP0) THEN
      SPT(LP0)=0 SPN(LP0)==+1
      IF SPN(LP0)>15 THEN
       SPN(LP0)=0
      FI
      SPIN(LP0)==+1
      IF SPIN(LP0)>3 THEN
       SPIN(LP0)=0
      FI
      ;Spin the poor guy.
      SES=SPNA(SPIN(LP0))
       PMST(PAD(LP0),EP,SES)
       PM_GO(STX(LP0),STY(LP0),PMM)
       AUDFC(4)=SPIN(LP0) AUDFC(5)=4
      ELSEIF EDF(LP0)>2 AND
      EDF(LP0)<5 THEN
       ;Reset player spinning var.s.
       AUDFC(6)=0 AUDFC(7)=0
       SPT(LP0)=0 SPN(LP0)=0
       ZERO(PAD(LP0),255) DIR(LP0)=1
       ;Put him back in the garage.
       STX(LP0)=124 STY(LP0)=96
       EMBR(LP0)
       PMST(PAD(LP0),EP,DIR(LP0))
       PM_GO(STX(LP0),STY(LP0),PMM)
       EDF(LP0)=0
     FI
    FI
   OD
   ;See if you want to move.
   STICK(4)
   ;Put your car on the screen.
   PMST(M0,P0,DIR(4))
   PM_GO(STX(4),STY(4),PMM)
   ;animation variable.
   PMM==+1
   IF PMM>2 THEN PMM=0 FI
   ;Game speed control.
   FOR CLP0=0 TO DELAY DO OD
   ;Start pressed?
  UNTIL CONSOL=6 OD
  TITLE()
 OD
RETURN

;This gets everything started.
PROC MAIN()
 ZERO(SCOR,8)
 MEM=RAMTOP ;Save top of ram.
 TITLE() START()
RETURN
;THE END?
```

●

Database Delphi

News and updates about the *ANALOG Computing* Atari Users' Group on Delphi

by Matthew J.W. Ratcliff

The 130XE keyboards are having problems, and we have some fixes this month. We'll take a quick look in my Email bag, and offer a few new Delphi tricks.

12251 28-NOV 21:39
From: LITTLEJ (John Little)
To: ALL

Several people I know (including myself) are having a problem with the 130XE keyboard. We're losing the console keys. Removing the plastic ribbon from its connector, cleaning it and reinserting will take care of the problem for a *very* short while. Does anyone know if Atari has an official fix for this?

12282 29-NOV 01:25
From: MATRAT (Matthew J.W. Ratcliff)
To: LITTLEJ

This is a *common* problem. I hope it doesn't occur with the ST function keys, as well. The problem with the 130XE console keys is that they are graphite contacts. Once they wear down, you need a whole *new* keyboard. Several dealers I know hope to get plastic inserts for the bum keyboards they've been collecting, but it's not likely they can get them.

12307 29-NOV 14:30
From: JOEPIERCE (Joe Pierce)
To: LITTLEJ

Well, we used to have the same problems with the 800XL's plastic ribbon cable running to the keyboard. I used to take a pair of scissors, cut about ⅛ of an inch off the end and plug it back in. It always worked for me.

MATRAT note:

I found that disassembling and reassembling your XL computer can be hazardous to the keyboard cable. It is easy to wear out, or bend the corners up on that thin plastic and conductor cable. I too found that trimming it back would cure the problem. But on the XEs the problem seems to be that the conductive material wears off the bottom of the console and keyboard keys.

In the January issue of ACE St. Louis, Charles Robinson detailed the XE keyboard problem and several alternatives for home repair. In brief, "the bottom of the key is made of a U-shaped piece of conductive rubber that bridges two pads on the circuit board to make a key closure." When it wears off, the key is dead—normally, you need a new keyboard. Charles repaired his defective keys with Nickel Print, a conductive ink from GC Electronics, catalog number 22-207. "A big 2-ounce bottle costs $3.83. . . most electronics/TV repair suppliers should. . . be able to order it for you." Charles also suggested that a Defroster Repair paint (catalog #15067) made by Loctite should do the job, too. It can probably be obtained at most auto parts stores for about $5.00.

Email bag and Delphi tips.

One user recently sent me some Email explaining that certain text files in our databases were apparently unreadable. A quick look revealed that this is not true; they just have the wrong RETURNS. These text files are in ASCII format, with standard carriage returns and line feeds (ASCII 13 and 10, respectively), not the ATASCII 155 we 8-bit Atarians are accustomed to. You can simply copy this file from your disk directly to the printer, with the printer's auto-line-feed feature off, and auto-skip over perforation set (dip switch settings; see your manual). Below is a quick and dirty BASIC program that will do the job for you, without switch changes on your printer:

```
10 GRAPHICS 0:DIM A$(40):?
"ASCII file to print ";:I
NPUT A$
20 OPEN #4,4,0,A$:OPEN #5,
8,0,"P:":LN=0:TRAP 100
30 GET #4,A
40 IF A<>13 THEN GOTO 70
50 PUT #5,155:GET #4,A:REM
 CONVERT CR/LF TO ATASCII
155
60 LN=LN+1:IF LN>56 THEN P
UT #5,12:LN=0:GOTO 30:REM
SKIP PERF
70 PUT #5,A:GOTO 30
100 IF PEEK(195)=136 THEN
? "DONE.":END
110 ? "UNEXPECTED ERROR ";
PEEK(195):END
```

Finally, here's your Delphi tip for the month. Whenever you're busy in the FORUM reading messages and someone pages you for a conference, use the /SEND command to let him know you're busy, like this: *FORUM*> /SEND MATRAT I'm busy in FORUM now, will CO later. It can be abbreviated to SEN. This command also works at the main ANALOG prompt and in the conference area.

Uninet, a popular alternative to the Tymnet networking service, has been absorbed into Telenet. Conferencing can now be done across networks, so Tymnet users may talk directly with Telenet callers. The Telenet link has an "instant backspace" echo, something they have never fixed with Tymnet. But Telenet still seems to have significant noise problems in many different areas. If you have troubles, leave Email to SERVICE about them and call 1-800-TELENET to explain what the problems are. When all the kinks are worked out, Telenet will probably be the preferred service over Tymnet.

Six Forks Assembler and Linker

SIX FORKS SOFTWARE
11009 Harness Circle
Raleigh, NC 27614
48K $39.00

by Kurt Oestreich

The competition between the various software packages has often been likened to a boxing match—with fewer rules, and more blood and casualties.

Perhaps the most violent of these bouts have been those between the machine language assemblers for 8-bit Atari computers. A few years ago, several assemblers were available, but today the market is dominated by one: MAC/65.

MAC/65 is undoubtedly one of the best assemblers ever written, with support for macros, fast assemblies, co-resident editor/assembler/debugger, error codes in English and a multiplicity of available operators. Together, these features helped MAC/65 stomp out AMAC (Atari Macro Assembler), Synassembler, MAE and the Atari Assembler Editor Cartridge.

I thought I would never find an assembler as good as MAC/65, let alone a better one. But the U.S. Postal Service has a way of popping up with surprises. Thankfully, they're not all bills.

A few months ago, I received the **Six Forks Assembler and Linker** (the **SFA&L**), and proceeded to put it through its paces. I feel there's no better way to test an assembler than to write something with it. The first thing I noticed about the **SFA&L** was the vast difference between its structure and that of MAC/65. Instead of writing source code into a built-in editor, Six Forks has you use a word processor that you provide. Also, instead of having one large source file, everything is broken down into small subroutines. The result of this approach was the completion of a program (a disk copier program for the David Byrd 288K 800+ upgrade) in roughly one-eighth the time I expected it to take.

Whoa! At that point, I thought either I must be getting very good, or (not being that conceited) the new software must have something to do with it.

Hmm . . . It doesn't have macros; it only supports one drive; it doesn't include an editor. Why do I like it so much? After examining the way I do things with MAC/65 and comparing that to what I am forced to do with the **SFA&L** package, I reached a conclusion.

The linker approach to writing software is superior. This is partially due to its emphasis on top-down design. The difference between top-down design and spaghetti programming is like the difference between building a house with blueprints and haphazardly throwing together a bunch of bricks and some plywood, then adding cellophane to plug the holes. (See the sidebar: "Structured Programming vs. The Spaghetti Gunslinger.") The linker also allows you to build up a collection of subroutines which need not change from program to program. In C and Pascal these collections are called "libraries." From my disk copier program alone, I already have several libraries to handle disk functions, equates, program errors and a number of other common program building blocks. These blocks need only be assembled once, then every time they're wanted for an object file, they need only be relinked. Sound confusing?

It's not. The steps are simple. First, you type in a source file (the text of a program) in an editor, such as a word processor. Then, you take the file and run it through the assembler. You now have a relocatable file. Several of these relocatable files are then joined together by the linker, which would finally produce the object file (the file you actually run). Most of the time, a fourth process is necessary: the debug stage, where logic errors in your program are found and eliminated. In the **SFA&L**, the source files are small, thus you have less to sort through when you find an error in the program. Additionally, when an error is found, only one source file need be modified and reassembled. It would then be relinked with the other (working) relocatable files to create the corrected object file. The linker approach also allows your programs to grow, as new routines may be added and then linked with the other sections of your earlier program.

MAC/65, by contrast, performs the task in a "quick and dirty" way, by having editor, assembler and debugger co-resident. This forces you to create large source files that are difficult to manage. To MAC/65's credit, it can assemble a file faster than most people blink. The drawback to MAC/65: this speed is for the assembly process, not the program development time.

Source files are entered in the standard format of:

```
LABEL   OPCODE OPERAND ; COMMENT
```

Unlike the MAC/65, the **SFA&L** package does not use line numbers. Because the source file is edited with a word processor, all editing functions may be done within the word processor, and the need for line numbers is eliminated. The method of selecting low byte and high byte is also different from that of MAC/65. Instead of MAC/65's syntax of:

```
LDA #MEMLO&255
```

Six Forks uses:

```
LDA #.LO.MEMLO
```

This is a bit strange, and the lack of the & operator is more than a little annoying. For some long-time machine language programmers, this could prove more of a problem than it did for me.

Actually running the assembler on a source file is relatively painless. First, you load in the assembler from DOS. Then, you specify the source name for the file and the PACKID (described later) of the disk. Remember that PACKIDs are limited to six characters and filenames must be limited to eight characters. The assembler then proceeds to go through three passes.

On the first pass, it determines which labels are local and which are external, and the relative values of the local variables. Pass two is exclusively for the purpose of finding syntax errors. The third and final pass creates the relocatable file and the assembly listing. For this pass, you are asked whether you want to use the printer or the screen for the listing. When the screen is specified, the lines are truncated (lopped off) to 40 columns for easier viewing. Several options are available in this view mode. The option I use most often scans for errors and stops only on errors. Other possibilities include: advance one line at a time, finish assembly, advance by one screen, and display the help menu which shows these alternatives. On finishing the listing—and providing no errors were detected—the relocatable file will be created.

During my evaluation, I discovered one bug in the assembler. For some reason, it just died on an LSR opcode that was missing the *A* specifier. Why this didn't cause an error instead of crashing, I don't know. Most assemblers will accept the instruction either way. Other than this, the software performed like a champion.

Running the linker also proved not too difficult. After the linker loads in from disk, you're prompted to select options for the listing and link process. Among the possibilities: direction of listing to printer, jumping past the control file listing, suppression of the numerically sorted load map, and suppression of the output file. After the options are selected, you specify the name of the control file. This is a text file that specifies which relocatable files to link and what filename to write the object file to. Finally, when the control file has been read, all the relocatable files are read in. If all goes well, an executable object file is written out. The linker will also produce a numerically sorted load map, as well as an alphabetically sorted one.

It should be noted that the extender on the filenames in the control file cannot be longer than one character; otherwise, the linker crashes. This was the only bug I found in the linker. Let's see, that's one bug for the assembler and one for the linker. Not a terrifying threat, I suppose, but I think this package could use a little insecticide.

The documentation is blunt and to the point. Six Forks seems to think that you should already know assembly language or spend an extra $20.00 for a decent machine language tutorial. I don't think this is out of line, and it does make finding information easier.

Although the table of contents is fairly comprehensive, the lack of an index is an inconvenience. However, as far as technical content is concerned, the documentation is more than adequate; it's certainly enough to allow intermediate to experienced programmers to learn the software

with relatively little pain. Additionally, the organization of the manual is superior to many I have seen, covering most aspects of the software satisfactorily. The only thing which I found inadequately covered is the necessity for PACKIDs.

A PACKID is a file on the disk with the name of the disk in it. The assembler and linker use these to make sure the right disk is in the drive. Why this should make any difference, I don't know. Perhaps it's a special feature for the easily confused. For the novice programmer, I guess this is a plus. It's probably also a plus for the professional machine language programmer with several source disks. For me, it was another annoyance. It seems that if the author went to all the trouble to use PACKIDs, the least he could do is support two drives. If you like flipping disks or have one drive anyway, you may not mind. I did.

From all I've said about what I *don't* like about the package, you might think I didn't like the product at all. On the contrary, I like it better than MAC/65. From me, this is high praise, indeed. I like **SFA&L** for its goodies:

(1) The Linker. This is the best thing about the package and almost makes up for the lack of macros. The linker approach allows program modification and growth to occur without letting the program become unmanageable. It also cuts development time drastically. As a system, the linker comes through like an Abrams tank: large, powerful and sophisticated.

(2) Lots of error codes. It's nice not to have to spend three hours trying to figure out what an error code means. The **SFA&L** package has well over 100 error codes, not including I/O errors.

(3) Truly helpful HELP screens. To me, it was wonderful to be able to pop up a menu at any time in the listing stage without losing information.

(4) Both alphabetically and numerically sorted symbol tables.

(5) A policy of telling you what's going on. When a program is being assembled or linked, it tells you what file is being read, what pass the software is on, and if the printer is busy.

For $39.00, I consider the **Six Forks Assembler and Linker** to be the best product on the market. For this price, you get 52 pages of documentation, and a disk with the assembler, the linker and several source files for the demo program. For this review, I ran the Six Forks package under MachDOS 2.1 in double density.

Kurt Oestreich has been computing for seven years and telecommunicating for three. He's knowledgeable in electronics (digital) and machine language. He knows Atari and Microsoft BASIC, but programs in Pascal, C and FORTH, and is now working on a new language, PL/C.

Structured Programming vs The Spaghetti Gunslinger

Too often, programmers learn their techniques from friends and from trial-and-error. While this is a rather adventuresome approach, it's often wasteful of time and causes unnecessary aggravation.

If these people were to read a book on programming, not just on language syntax, they would discover that design is equally, if not more, important than the end result.

The key word here is *design*. Not only is it important to get a program done, the structure is also important. If code is well organized and easily understood, then the code may be later modified by any programmer.

Structured programming is a philosophy that programs should be as understandable as possible. To achieve this, a number of techniques may be used. Among them:

(1) *Self documentation.* REM statements and comments. This is particularly important at the beginning of major sections of the program and at the top of subroutines. These comments should include: the purpose of the program/subroutine; input variables, labels or addresses; and output variables, labels or addresses. If you don't document what you're doing in a program, you *will* forget, and someone else will not be able to decipher your logic.

(2) *No GOTOs or JMPs.* Use of GOTO, particularly to exit a loop or subroutine, is a naughty thing to do and denies code legibility. If you analyze the problem properly, you should be able to exit subroutines via RETURN or RTS.

(3) *Heavy use of subroutines.* If you *analyze* your task, you should be able to break it down into digestible chunks. Use subroutines for your subroutines. Any task that is logically different or significant should be given its own subroutine. In BASIC, you should be aware of what globals the subroutine changes. In assembly, you should make labels local, except for the entry and exit parameters.

(4) *Top-down design.* This is the strategy of writing the main program first, then using subroutines, as outlined above, to transform large tasks into smaller ones.

(5) *Use of spaces to show program flow.* Examine the following two programs:

Example 1.

```
FOR THETA=1 TO 360;
  R=THETA/30;
  POLARPLOT THETA,R;
  IF R<1 THEN DO
    BEGIN
      R=R*2^R;
      THETA=THETA+10;
    END;
  POLARPLOT THETA,R;
NEXT THETA;
```

Example 2.

```
FOR THETA=1 TO 360;
R=THETA/30;
POLARPLOT THETA,R;
IF R<1 THEN DO
BEGIN
R=R*2^R;
THETA=THETA+10;
END;
POLARPLOT THETA,R;
NEXT THETA;
```

You can see in the first example that everything is set in a hierarchy. Anything controlled by another condition is indented the same amount of spaces. In the second example, anything could be associated with anything—you would have to know the language in order to understand the program logic.

Those are the basic points of structured programming. Anything not so organized that makes frequent use of GOTOs to exit FOR-NEXT loops and similar atrocities falls in the realm of the "Spaghetti Gunslinger" approach. As most professional programmers will agree, shooting from the hip is not the best way to go.

Boot Camp

Another step along on the animation trail.

by Karl E. Wiegers

Not long ago, I attended my first meeting of an Atari users' group, ACORN (Atari Computer Owners of Rochester, New York). ACORN's 8-bit disk librarian, Nick Cup, demonstrated his clever BASIC program illustrating some nifty aspects of character set animation. The program is an electronic birthday card Nick wrote for his girlfriend, Judy. It shows a man and woman holding hands, bending toward each other and kissing (repeat *ad infinitum*, or *ad System Resetum*). Nick was kind enough to share his BASIC source code with me, and today I present the same program in assembly language.

Nick's program extends last month's introduction to redefined character sets in assembly programs. Before, we talked about creating a modified character set for use in graphics 0; Nick's program uses the five-color text mode called ANTIC 5. Last time, we copied the character set from ROM into RAM, then changed just a few characters. We also discussed loading a complete character set from disk. In today's program, the entire custom character set resides within the assembly program as a bunch of .BYTE statements. The bad news is that you have to type them all in. We'll also cover random numbers, animation methods, timing loops and some clever tricks Nick played on the Atari operating system. Onward . . .

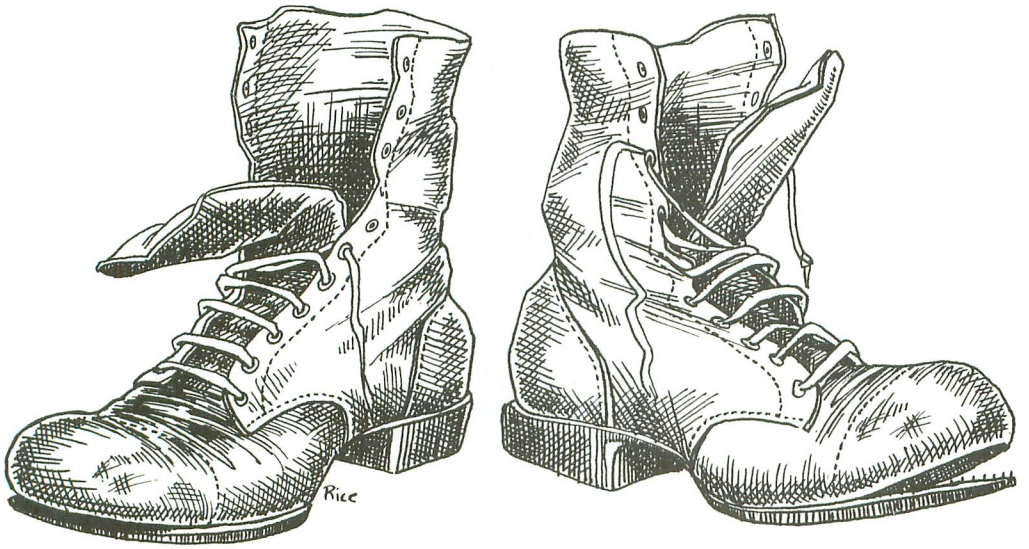
Character animation.

Have you ever discovered that four (okay, five) players just can't handle the animation needs of a program? Character sets come to the rescue! You can create a set of characters with just the shapes you want and move them around the screen along with the players. In BASIC, you'd PRINT these characters; in assembly, we'll rely on the PUTREC command of CIO—the same thing, really.

There are several steps in designing a character animation process. Animation consists of the rapid replacement of one image with another that is slightly different. If the changes are subtle and the substitution rapid, your eye and brain will blur the process into a smooth movement. In practice, we're limited by the complexity of the images and the speed of the overall process.

In today's example, we begin with a man (Nick) and a woman (Judy) facing each other and holding hands. That's image 1 (call it STANDING). The final image shows them kissing (okay, call it KISSING). To smooth things out, we need a couple of intermediate images that show the happy couple approaching each other (BENDING) and nearly touching (ALMOST). If we print these images successively at the same place on the screen, we'll get the animation we seek. Our complete animation sequence consists of: STANDING, BENDING, ALMOST, KISSING, ALMOST, BENDING and STANDING again. Repeating this pattern over and over gives a more or less continuous motion. To avoid the dreadful boredom of rhythmic kissing, we'll pause for random times at the STANDING and KISSING stages.

But how are we going to create the four images we need? And what graphics mode should we use? In this case, Nick chose ANTIC mode 5, also known as graphics 13 on the XL/XE machines. This mode has pixels the same size as graphics 2 (ANTIC 7), 16 by 16. ANTIC 5 produces characters in four colors, depending on the bit pattern (*00, 01, 10, 11*) of each pair of bits in the byte defining one scan line of the character. (Actually, each byte defines two scan lines, just as in graphics 2; ANTIC 4 is the analogous mode with one scan line per data byte.) Each bit pattern selects a different color register. The *01* selects color register COLOR0, at address $2C4; *10* chooses register COLOR1 ($2C5); *11* calls on register COLOR2 at $2C6; and *00* dis-



plays the background color from $2C8. An ANTIC 5 character displayed in reverse video uses color register 3 ($2C7) for the 11-bit patterns, and the other patterns are unchanged.

Now, how do we redefine the characters to look the way we want? By using a good character set editor program, of course. You need one that handles ANTIC 5, and preferably one that lets you design blocks of several characters at a time. A good choice is "Antic Aerobics" by Charles Brannon, which appeared in the October 1983 issue of *COMPUTE!* magazine.

Nick spent some time with "Antic Aerobics." He decided to use a block of characters 8 wide by 4 deep for the movement part of the animation. Two pairs of legs (Nick's and Judy's) are stationary during the process, and that took an 8×2 block of characters. Let's see—8 times 4 is 32, times 4 images is 128, plus 16 for the legs equals 144 characters needed. But we only have 128 characters in a set. Whatever shall we do?

We have two choices. We could use some display list interrupts to employ several character sets in one screen. (Really, we do this anyway, so the normal letters saying *Happy Birthday* appear above the animated display.) Fortunately, though, a number of the characters in the 8×4 boxes are blanks, and a few others can be used in more than one place. So we can get away with only about 120 or so unique characters. There are some morals here:

(1) Always leave a blank character in your redefined set. You really only have 127 to play with.

(2) Plan ahead. Some careful work with graph paper, or a good eye for shapes (which I don't have) might keep you from running out of available character slots prematurely.

Now, let's dive into the program and see some other tricks of the trade.

Setting the scene.

As usual, we must figure out how to allocate memory for our tasks. We need room for the character set, 1024 bytes; a custom display list of about 20 bytes; a display list interrupt of about a dozen bytes; screen display RAM for a mixed ANTIC 5 and 7 display rounding up to 512 bytes; the text strings that will be printed as our four images plus legs need about 150 bytes; and, lest we forget, a program of some kind will need space.

Since we all now have plenty of memory in our Ataris, I like to be generous with RAM. I put the character set from address $4000 to $43FF (Line 580). And there they all are, from Lines 600-2700, at 8 bytes apiece. The ones with eight *0*s are blanks, or else unused in this redefined set.

Following the character set is the display list, at $4400 (Lines 2760-2820). This display consists of six mode lines of ANTIC 7 and six of ANTIC 5. The standard character set is used in the ANTIC 7 segment, so we need a display list interrupt (DLI) in the last mode line of that segment (the *135* in Line 2800).

Note the use of the .WORD operative. This places the data following the operative into 2 consecutive bytes, in low-byte/high-byte order. In Line 2790, I load the address of the beginning of screen RAM into the display list. Line 520 of the listing defined SCRRAM as beginning at location $4800. Similarly, Line 2820 loads the address of the display list itself into the final 2 bytes of the display list, as is proper. I imagine you can comprehend this display list from our earlier discussions.

The DLI is at address $4500. It simply switches to our custom character set halfway down the screen, as we have seen done before. Address CHSET is defined in Line 620.

Finally, the program code begins at $5000. First, Lines 3090-3130 zero out two pages of screen RAM, which is

enough for this display list (6*20+6*40=360 bytes needed). Lines 3140-3170 set the pointer to the DLI. Lines 3180-3190 make the cursor invisible.

Line 3200 performs an important, yet obscure function. You'll recall that a number of the characters in the standard set are used for cursor movement, screen clearing and the like. We can use these in our modified set, but we need to tell the operating system to disregard any standard function they have and just display the dot patterns we assign to that character number. Storing any nonzero value in location DSPFLG ($2FE, decimal 766) takes care of this problem. If you omit this step, funny things happen.

Lines 3210-3240 point toward the beginning of screen RAM. Lines 3250-3260 turn off the display screen while we set things up. The first big trick takes place in Line 3270.

You may recall from earlier issues that we opened the display screen device, S:, for a particular graphics mode, then printed using IOCB #6. Nick did something sneakier. He told the computer to use this mixed ANTIC 6 and 7 display list, but he let the computer continue to think it was in graphics mode 0. This has a couple of ramifications. First, we can use IOCB #0, the default for printing to device E:, and have no need to open the screen. Second, the settings of the left and right margins, which only have meaning in graphics 0, are respected.

Skip down to Lines 3560-3590, and you'll see that we closed the margins down so the printable area is only eight characters wide. By printing a string of all thirty-two characters for one Nick-and-Judy image now, you'll get a stack of four lines of eight characters each. This keeps us from having to build 20-byte long strings of characters to fill an ANTIC 5 line, with all blanks except the image part in the middle of the screen. Clever, eh?

Lines 3280-3370 load the color registers with the desired values. Lines 3380-3410 activate our custom display list, and Lines 3420-3430 activate the DLI. The screen comes back to life in Lines 3440-3450. The *Happy Birthday* greeting is printed in Lines 3480-3550. (Hint: change the name in Line 4800 to impress your own special friend if he or she isn't named Judy.)

Ready, set, *animate!*

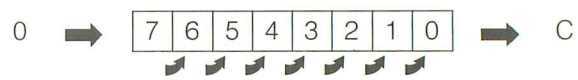
The rest of the program performs the animation, between MAINLOOP in Line 3620 and the JMP MAINLOOP instruction in Line 4090. First, print the STANDING image, in Lines 3630-3670. We use subroutines to help us save code, as with the POSITION routine (Lines 4320-4370), since we're printing each image in the same place on the screen. The PRINTLINE subroutine should be familiar from earlier columns.

Another subroutine, DOLEGS, performs multiple functions. What's the first one? It prints the constant shapes of the legs, of course, in Lines 4440-4530. We have to print these each time, because the changing upper body image overwrites the top row of legs, due to the carriage return (EOL) character.

Next, DOLEGS pauses for a fixed period of time, by using the DELAY subroutine. DELAY (Lines 4650-4720) relies on the internal real-time clock in the Atari operating system. This clock uses the 3 bytes at addresses $12-$14. The least significant byte, $14, is incremented during each vertical blank interval, or sixty times per second (1/60 of a second is called a "jiffy"—honest). DELAY begins by setting address $14 to *0*, then looping until the address reaches some value in the data byte I called TIMER, before returning. In Lines 4540-4550, I stored a *3* in TIMER, indicating that I want each image to hang around for three jiffies before the program continues. Increasing this value slows down the action; decreasing it to 2 or 1 shows how enthusiastic Nick and Judy can be.

To make things less repetitive, we're going to show the STANDING image a bit longer before printing the next image. Location $D20A (RANDOM) acts as a random number generator, producing a value between *0* and *255* each time you look in it. Line 3690 fetches such a random number. After trying this for a while, I felt the action was slowed down too much, so I decided to take the random number thus retrieved, and divide it by *2* before using it.

The LSR A instruction in Line 3700 divides the contents of the accumulator by *2*. Really, it performs a *Logical Shift Right* operation. Each bit in the accumulator is moved to the adjacent less significant position. The value of bit 0 is moved into the carry flag of the processor status register, and a *0* is placed in bit 7, like this:



If you think about this operation, you should realize that the net result is to divide the contents of the accumulator by two. Anyway, I store the resulting value into TIMER and do another delay in Lines 3710-3720.

Continuing with the main loop, we print the BENDING position with legs and pause (paws?) in Lines 3730-3790. Following closely is the ALMOST position in Lines 3800-3850. Finally, we reach that special moment when lips touch (Lines 3860-3910). Another random delay seemed in order here (Lines 3920-3950). Finally, run the whole operation in reverse, with ALMOST and BENDING, and loop back around to repeat the STANDING position. As usual, it takes a RESET to break out of the program.

You may notice that the characters look a bit blocky. You can double the vertical resolution by using ANTIC 4 rather than ANTIC 5. The bad news is that if you want the same size images, you'll need twice as many individual characters (sixty-four per image rather than thirty-two). That means two RAM character sets and twice as many hours with a character set editor. You make the choice. Personally, all *my* girlfriend noticed was that the name was Judy and not Chris.

Wrapping up.

I'll recap what we covered concisely. ANTIC 5. Character set animation. Typing .BYTE statements. The .WORD directive. DSPFLG. Random numbers. Real-time clock delay loop. LSR instruction. Outwitting the operating system. Kissing. Need we say more?

(Listing starts on next page.)

Listing 1.
Assembly listing.

```
10 ;Character Graphics Animation
20 ;in Antic Mode 5
30 ;
40 ; by Karl E. Wiegers
50 ;
60       .OPT NO LIST
70 ;
80 ;CIO command equates
90 ;
0100 OPEN =  $03
0110 PUTREC = $09
0120 EOL =   $9B
0130 ;
0140 ;equates for timing delay loop
0150 ;
0160 RTCLOK = $14
0170 TIMER = $CB
0180 ;
0190 ;screen control equates
0200 ;
0210 LMARGN = $52
0220 RMARGN = $53
0230 ROWCRS = $54
0240 COLCRS = $55
0250 DINDEX = $57
0260 SAVMSC = $58
0270 VDSLST = $0200
0280 SDMCTL = $022F
0290 COLOR0 = $02C4
0300 SDLSTL = $0230
0310 CRSINH = $02F0
0320 DSPFLG = $02FE
0330 ;
0340 ;CIOV address equates
0350 ;
0360 ICCOM = $0342
0370 ICBAL = $0344
0380 ICBLL = $0348
0390 ICAX1 = $034A
0400 ICAX2 = $034B
0410 CIOV =  $E456
0420 ;
0430 ;hardware registers used
0440 ;
0450 RANDOM = $D20A
0460 CHBASE = $D409
0470 WSYNC = $D40A
0480 NMIEN = $D40E
0490 ;
0500 ;screen RAM starts at $4800
0510 ;
0520 SCRRAM = $4800
0530 ;
0540 ;*********************************
0550 ;redefined Antic 5 character set
0560 ;*********************************
0570 ;
0580     *=  $4000
0590 ;
0600 ;chars 0 - 7
0610 ;
0620 CHSET
0630      .BYTE 0,0,0,0,0,0,0,0
0640      .BYTE 0,0,0,2,10,42,42,170
0650      .BYTE 0,0,0,0,0,0,0,0
0660      .BYTE 0,0,0,170,170,170
0670      .BYTE 169,169
0680      .BYTE 0,0,0,0,128,160,80,20
0690      .BYTE 0,0,0,0,0,3,5,20
0700      .BYTE 0,0,0,63,255,255,127,95
0710      .BYTE 0,0,0,240,252,255
0720      .BYTE 255,255
0730 ;chars 8 - 15
0740      .BYTE 170,170,170,170,170
0750      .BYTE 170,42,42
0760      .BYTE 165,165,165,149,149
0770      .BYTE 149,149,84
0780      .BYTE 85,85,87,85,85,80,64,0
0790      .BYTE 85,85,85,213,85,21,0,0
0800      .BYTE 87,86,86,89,85,85,85,85
0810      .BYTE 255,255,127,95,92,84
0820      .BYTE 80,80
0830      .BYTE 0,0,0,3,3,15,15,15
0840      .BYTE 235,251,255,207,207
0850      .BYTE 243,252,255
0860 ;chars 16 - 23
0870      .BYTE 255,255,207,207,243
0880      .BYTE 252,255,63
0890      .BYTE 0,0,192,192,192,0
0900      .BYTE 245,244
0910      .BYTE 3,3,3,0,3,15,31,92
0920      .BYTE 255,207,63,252,243
0930      .BYTE 207,63,255
0940      .BYTE 255,207,63,255,255
0950      .BYTE 255,255,255
0960      .BYTE 192,192,192,240,240
0970      .BYTE 252,252,255
0980      .BYTE 63,63,63,63,255,255
0990      .BYTE 63,15
1000      .BYTE 207,240,240,240,252
1010      .BYTE 252,252,255
1020 ;chars 24 - 31
1030      .BYTE 245,0,0,0,0,0,0,0
1040      .BYTE 0,0,0,0,0,0,0,0
1050      .BYTE 1,0,0,0,0,0,0,0
1060      .BYTE 85,85,85,85,85,85,84,84
1070      .BYTE 64,64,0,0,0,0,0,0
1080      .BYTE 2,0,0,0,0,0,0,0
1090      .BYTE 170,170,170,170,42
1100      .BYTE 42,42,10
1110      .BYTE 160,160,160,160,160
1120      .BYTE 160,160,160
1130 ;chars 32 - 39
1140      .BYTE 0,0,0,2,2,2,10,10
1150      .BYTE 0,42,170,170,170
1160      .BYTE 170,170,170
1170      .BYTE 0,128,160,168,84
1180      .BYTE 69,85,85
1190      .BYTE 0,0,0,0,0,0,64,80
1200      .BYTE 0,0,0,0,0,0,1,5
1210      .BYTE 0,0,3,15,21,81,85,85
1220      .BYTE 0,255,255,255,255
1230      .BYTE 127,111,111
1240      .BYTE 0,192,240,252,252
1250      .BYTE 255,255,255
1260 ;chars 40-47
1270      .BYTE 10,10,10,10,2,2,2,0
1280      .BYTE 169,169,169,169,169
1290      .BYTE 169,169,41
1300      .BYTE 87,85,85,85,84,80,80,80
1310      .BYTE 64,192,64,0,0,0,0,0
1320      .BYTE 1,0,1,1,0,0,0,0
1330      .BYTE 21,85,85,85,21,5,1,1
1340      .BYTE 151,85,85,85,85
1350      .BYTE 85,85,85
1360      .BYTE 255,255,124,124,92
1370      .BYTE 64,64,64
1380 ;chars 48-55
1390      .BYTE 3,3,3,3,3,15,15,15
1400      .BYTE 250,255,63,207,243
1410      .BYTE 252,255,255
1420      .BYTE 240,252,63,207,240
1430      .BYTE 255,63,207
1440      .BYTE 0,0,0,0,0,244,245,244
1450      .BYTE 0,0,0,0,31,95,31,64
1460      .BYTE 15,15,12,3,255
1470      .BYTE 255,255,0
1480      .BYTE 255,63,255,255,252
1490      .BYTE 243,15,255
1500      .BYTE 252,60,60,63,255
1510      .BYTE 255,255,255
1520 ;chars 56-63
1530      .BYTE 63,63,63,63,63
```

```
1540      .BYTE 255,255,255
1550      .BYTE 255,255,255,255,255
1560      .BYTE 255,255,255
1570      .BYTE 240,252,252,252,252
1580      .BYTE 255,255,255
1590      .BYTE 15,15,15,15,2,2,2,2
1600      .BYTE 255,255,255,255,170
1610      .BYTE 170,170,170
1620      .BYTE 255,255,255,255,160
1630      .BYTE 160,160,160
1640      .BYTE 84,84,84,84,220
1650      .BYTE 245,207,195
1660      .BYTE 0,0,0,0,0,0,192,240
1670 ;chars 64-71
1680      .BYTE 0,0,0,10,42,42,170,170
1690      .BYTE 0,0,0,168,170,170
1700      .BYTE 165,164
1710      .BYTE 0,0,0,0,0,128,64,80
1720      .BYTE 0,0,0,0,0,3,1,5
1730      .BYTE 0,0,0,63,255,255,95,23
1740      .BYTE 0,0,0,252,255,255
1750      .BYTE 255,255
1760      .BYTE 0,0,0,0,0,192,240,240
1770      .BYTE 0,2,2,2,2,2,2,0
1780 ;chars 72-79
1790      .BYTE 149,149,149,149,85
1800      .BYTE 85,85,84
1810      .BYTE 84,85,84,92,84,80,0,0
1820      .BYTE 21,85,21,5,21,5,0,0
1830      .BYTE 87,86,86,89,85,85,85,85
1840      .BYTE 255,255,127,87,87
1850      .BYTE 85,84,84
1860      .BYTE 240,240,240,192,192
1870      .BYTE 192,0,0
1880      .BYTE 3,3,3,3,15,15,15,15
1890      .BYTE 171,239,255,207,243
1900      .BYTE 252,255,255
1910 ;chars 80-87
1920      .BYTE 252,255,207,243,252
1930      .BYTE 255,63,207
1940      .BYTE 0,0,0,192,192,0,244,245
1950      .BYTE 0,0,0,0,0,31,95,31
1960      .BYTE 255,255,243,207,63
1970      .BYTE 255,252,195
1980      .BYTE 255,255,243,243,207
1990      .BYTE 63,255,255
2000      .BYTE 192,192,240,240,252
2010      .BYTE 252,252,255
2020      .BYTE 63,63,63,63,255
2030      .BYTE 255,255,63
2040      .BYTE 243,240,252,252,255
2050      .BYTE 255,255,255
2060 ;chars 88-95
2070      .BYTE 244,0,0,0,0,0,0,192
2080      .BYTE 64,0,0,0,0,0,0,0
2090      .BYTE 255,63,63,63,2,2,2,2
2100      .BYTE 255,255,255,255,170
2110      .BYTE 170,170,170
2120      .BYTE 0,0,0,0,0,0,0,0
2130      .BYTE 0,0,0,0,0,0,0,0
2140      .BYTE 0,0,0,0,0,0,0,0
2150      .BYTE 0,0,0,0,0,0,0,0
2160 ;chars 96-103
2170      .BYTE 0,0,0,0,0,2,2,2
2180      .BYTE 0,0,42,170,170
2190      .BYTE 170,170,170
2200      .BYTE 0,0,128,168,170
2210      .BYTE 149,145,149
2220      .BYTE 0,0,0,0,0,0,64,80
2230      .BYTE 0,0,0,0,0,0,1,5
2240      .BYTE 0,0,3,15,63,87,69,85
2250      .BYTE 0,0,255,255,255
2260      .BYTE 255,255,127
2270      .BYTE 0,0,0,192,192,240
2280      .BYTE 252,252
2290 ;chars 104-111
2300      .BYTE 10,10,10,10,2,2,2,0
2310      .BYTE 170,170,170,170,170
2320      .BYTE 170,170,170
2330      .BYTE 149,85,85,85,85
2340      .BYTE 84,80,80
2350      .BYTE 84,208,112,80,64,0,0,0
2360      .BYTE 21,4,1,5,5,1,0,0
2370      .BYTE 85,85,85,85,85,85,21,5
2380      .BYTE 111,111,151,85,85
2390      .BYTE 85,85,85
2400      .BYTE 252,252,252,240
2410      .BYTE 240,64,0,0
2420 ;chars 112-119
2430      .BYTE 3,15,15,15,15,15,15,63
2440      .BYTE 234,254,63,207,243
2450      .BYTE 252,255,255
2460      .BYTE 176,252,63,207,240
2470      .BYTE 255,63,207
2480      .BYTE 0,0,0,0,0,245,244,245
2490      .BYTE 0,0,0,0,31,31,95,0
2500      .BYTE 63,60,60,3,255
2510      .BYTE 255,252,3
2520      .BYTE 255,252,252,252,252
2530      .BYTE 243,15,255
2540      .BYTE 240,240,240,240,252
2550      .BYTE 252,252,255
2560 ;chars 120-127
2570      .BYTE 63,63,63,255,255
2580      .BYTE 255,255,255
2590      .BYTE 240,252,252,252,252
2600      .BYTE 255,255,255
2610      .BYTE 255,63,63,63,10
2620      .BYTE 10,10,10
2630      .BYTE 255,255,252,252,160
2640      .BYTE 160,160,160
2650      .BYTE 10,10,10,10,10
2660      .BYTE 10,63,252
2670      .BYTE 160,160,160,160,160
2680      .BYTE 160,240,240
2690      .BYTE 0,0,0,0,0,0,0,0
2700      .BYTE 0,0,0,0,0,0,0,0
2710 ;
2720 ;*******************************
2730 ;display list
2740 ;*******************************
2750 ;
2760      *=  $4400
2770 ;
2780 DLIST .BYTE 112,112,112,71
2790      .WORD SCRRAM
2800      .BYTE 7,7,7,7,135
2810      .BYTE 5,5,5,5,5,65
2820      .WORD DLIST
2830 ;
2840 ;*******************************
2850 ;DLI to change character set
2860 ;*******************************
2870 ;
2880      *=  $4500
2890 ;
2900 DLI PHA
2910      LDA #CHSET/256
2920      STA WSYNC
2930      STA CHBASE
2940      PLA
2950      RTI
2960 ;
2970 ;*******************************
2980 ;   MAIN PROGRAM STARTS HERE
2990 ;*******************************
3000 ;
3010      *=  $5000
3020 ;
3030      CLD           ;binary mode
3040      LDA #0
3050      TAX
3060 ;
3070 ;zero out screen ram area
3080 ;
3090 ZERO
```

```
3100      STA SCRRAM,X
3110      STA SCRRAM+$0100,X
3120      INX
3130      BNE ZERO
3140      LDA #DLI&255 ;point to DLI
3150      STA VDSLST
3160      LDA #DLI/256
3170      STA VDSLST+1
3180      LDA #1       ;turn off cursor
3190      STA CRSINH   ;and cursor
3200      STA DSPFLG   ;control chars.
3210      LDA #SCRRAM&255 ;point to
3220      STA SAVMSC   ;screen RAM
3230      LDA #SCRRAM/256
3240      STA SAVMSC+1
3250      LDA #0       ;turn off screen
3260      STA SDMCTL
3270      STA DINDEX   ;pretend Gr. 0
3280      LDA #60      ;set color regs.
3290      STA COLOR0   ;pink
3300      LDA #36      ;light brown
3310      STA COLOR0+1
3320      LDA #34      ;dark brown
3330      STA COLOR0+2
3340      LDA #70      ;purple
3350      STA COLOR0+3
3360      LDA #0       ;black
3370      STA COLOR0+4
3380      LDA #DLIST&255 ;point to
3390      STA SDLSTL   ;display list
3400      LDA #DLIST/256
3410      STA SDLSTL+1
3420      LDA #192     ;enable DLIs
3430      STA NMIEN
3440      LDA #34      ;turn screen
3450      STA SDMCTL   ;back on
3460      LDA #0       ;position cursor
3470      STA ROWCRS   ;at 2,0
3480      LDA #2
3490      STA COLCRS
3500      LDX #0       ;use IOCB #0
3510      LDA #HAPPY&255 ;print Happy
3520      STA ICBAL,X ;Birthday
3530      LDA #HAPPY/256 ;line with
3540      STA ICBAL+1,X ;victim's name
3550      JSR PRINTLINE
3560      LDA #14      ;close Graphics 0
3570      STA LMARGN   ;margins to 14
3580      LDA #21      ;(left) and 21
3590      STA RMARGN   ;(right)
3600      JSR POSITION ;cursor at 14,3
3610      LDX #0       ;IOCB #0
3620 MAINLOOP
3630      LDA #STANDING&255 ;print 1st
3640      STA ICBAL,X ;image of
3650      LDA #STANDING/256 ;the happy
3660      STA ICBAL+1,X ;couple
3670      JSR PRINTLINE
3680      JSR DOLEGS   ;add some legs
3690      LDA RANDOM   ;get random #
3700      LSR A        ;divide by 2
3710      STA TIMER    ;wait this many
3720      JSR DELAY    ;jiffies extra
3730      LDX #0
3740      LDA #BENDING&255 ;now print
3750      STA ICBAL,X ;2nd image
3760      LDA #BENDING/256
3770      STA ICBAL+1,X
3780      JSR PRINTLINE
3790      JSR DOLEGS   ;legs & paws
3800      LDA #ALMOST&255 ;3rd image
3810      STA ICBAL,X
3820      LDA #ALMOST/256
3830      STA ICBAL+1,X
3840      JSR PRINTLINE
3850      JSR DOLEGS   ;(paws=pause)
3860      LDA #KISS&255 ;4th image
3870      STA ICBAL,X ;contact!
3880      LDA #KISS/256
3890      STA ICBAL+1,X
3900      JSR PRINTLINE
3910      JSR DOLEGS   ;(ha,ha,ha)
3920      LDA RANDOM   ;linger a bit,
3930      LSR A        ;savor the moment
3940      STA TIMER
3950      JSR DELAY
3960      LDX #0
3970      LDA #ALMOST&255 ;3rd image -
3980      STA ICBAL,X ;pulling
3990      LDA #ALMOST/256 ;apart
4000      STA ICBAL+1,X
4010      JSR PRINTLINE
4020      JSR DOLEGS
4030      LDA #BENDING&255 ;2nd image
4040      STA ICBAL,X
4050      LDA #BENDING/256
4060      STA ICBAL+1,X
4070      JSR PRINTLINE
4080      JSR DOLEGS   ;this is fun,so
4090      JMP MAINLOOP ;keep going
4100 ;
4110 ;*********************************
4120 ;   SUBROUTINES START HERE
4130 ;*********************************
4140 ;-------------------------------
4150 ;sub. to print up to 40 chars
4160 ;of a line; point to address of
4170 ;line before calling PRINTLINE
4180 ;-------------------------------
4190 PRINTLINE
4200      LDA #40
4210      STA ICBLL,X
4220      LDA #0
4230      STA ICBLL+1,X
4240      LDA #PUTREC
4250      STA ICCOM,X
4260      JSR CIOV
4270      RTS
4280 ;-------------------------------
4290 ;sub. to position cursor at 14,3
4300 ;in our fake Gr. 0 screen
4310 ;-------------------------------
4320 POSITION
4330      LDA #14
4340      STA COLCRS
4350      LDA #3
4360      STA ROWCRS
4370      RTS
4380 ;-------------------------------
4390 ;sub. to print the legs each
4400 ;each time; pause 3 jiffies; set
4410 ;up to print next line
4420 ;-------------------------------
4430 DOLEGS
4440      LDA #14      ;position cursor
4450      STA COLCRS   ;at 14,7
4460      LDA #7
4470      STA ROWCRS
4480      LDX #0
4490      LDA #LEGS&255 ;print the legs
4500      STA ICBAL,X
4510      LDA #LEGS/256
4520      STA ICBAL+1,X
4530      JSR PRINTLINE
4540      LDA #3       ;want to wait
4550      STA TIMER    ;3 jiffies
4560      JSR DELAY    ;call delay sub.
4570      JSR POSITION ;cursor for next
4580      LDX #0       ;line & IOCB #0
4590      RTS
4600 ;-------------------------------
4610 ;sub. to do nothing until real-
4620 ;time clock has incremented to
4630 ;desired number of jiffies
4640 ;-------------------------------
4650 DELAY
```

```
4660       LDA #0         ;initialize clock
4670       STA RTCLOK
4680 DELAY2
4690       LDA RTCLOK ;compare to value
4700       CMP TIMER  ;you put in TIMER
4710       BNE DELAY2 ;until they match
4720       RTS
4730 ;
4740 ;*******************************
4750 ;  TEXT LINES TO PRINT ARE HERE
4760 ;*******************************
4770 ;
4780 HAPPY
4790       .BYTE " HAPPY BIRTHDAY     "
4800       .BYTE "      JUDY",EOL
4810 STANDING
4820       .BYTE "@ABCDEFG"
4830       .BYTE "HIJKLMNO"
4840       .BYTE "PQRSTUVW"
4850       .BYTE "XYZ   [\]",EOL
4860 BENDING
4870       .BYTE "♦abcdefg"
4880       .BYTE "hijklmno"
4890       .BYTE "pqrstuvw"
4900       .BYTE "xyz   [\♠",EOL
4910 ALMOST
4920       .BYTE " ♥┣┣┫┗┛"
4930       .BYTE "╲╱▗▖"
4940       .BYTE "▀▄┳┣●┃"
4950       .BYTE "▌▐  ┗┏]",EOL
4960 KISS
4970       .BYTE " !"#$%&' "
4980       .BYTE " ()*+,- "
4990       .BYTE "./012345"
5000       .BYTE "6Y789[\]",EOL
5010 LEGS
5020       .BYTE ":;<  =>?"
5030       .BYTE "  ^_   |K",EOL
```

●

The End User

THIS MONTH:

A moving experience, a joystick, and a request: documentation that delivers.

by Arthur Leyenberger

The big news for me this month is a move into a new house. Seems like it happens every seven years, kind of like the locust plague. I wish it didn't have to happen at all, but when you've run out of elbow room, you have no other choice.

When the Atari 800 first came to our house in 1982 (it certainly seems like a long time ago), it started off in the spare bedroom. At the time, we thought a computer, disk drive and printer didn't take up *that* much room. Well, anyone reading this column knows how it goes. Three pieces of hardware do not a computer system make. I mean, you *have* to have some software. And maybe a modem, so you can "work at home." On and on it goes.

On and on it went. Within the year, the computer and I were relegated to the basement. Well, that's *one* way to clean up a basement. You clean up so you can move more stuff in. Bookshelves were added, as was a quality chair for those long hours at the keyboard. More computers, more software, more bookcases, more hardware. It grew and grew. At the height, there were at least eight computers down there, from six different companies.

Fortunately, I came to my senses. . .er, had my senses brought *to* me, so to speak. One by one, the "off brand" computers were disposed of. Out went the Commodore 64 and its ultra-slow disk drive. To think that our friend Jack Tramiel once foisted this stuff on the American public is, well, amazing.

The big Kaypro with the hard disk finally went last year. It was a workhorse, resembling a Clydesdale more than a Thoroughbred. The bright, green glow of its 9-inch monitor will no longer illuminate the wee basement hours.

My two portable computers, a trusty Radio Shack Model 100 and a not-often-used Workslate, still make up my computer stable—but are kept securely and comfortably in their respective carrying cases. Sometime soon, I'll write about that Model 100. It is, frankly, one of the most useful Atari peripherals I own.

An 800XL and a 130XE are stored in the closet, ready to appear at a moment's notice. They represent two different eras in Atari computing. For my needs, however, they represent two operating systems on which software can be checked.

What does that leave me? Well, I have my original Atari 800 from four years ago, with the Bit-3 80-column card. It has yet to be pulled for unscheduled maintenance. That machine has one of the best keyboards I've used in my ten-plus years of computing. It looks a little shopworn, but I personally admire the fine patina on the edges of the keyboard.

A 1-meg Atari 520ST in full regalia sits nearby. Two Atari double-sided drives, a Paradox 5¼-inch drive and a Supra 20-meg hard disk complete the scene. Of course, an early monochrome and early RGB monitors add the finishing touch to my powerhouse workstation. An MS-DOS computer, a fine AT&T 6300, keeps the ST company on the same desk. The ST and the 6300 get along surprisingly well together.

Then too, three or so printers, dozens and dozens of disks, computer printouts, soon-to-be reviewed (honest) software and much, much more add to the *ortgeist*, the spirit of the place.

Arthur Leyenberger is a human factors psychologist and free-lance writer living in New Jersey. He's been writing about computers for four years and continues to be an Atari enthusiast. When not computing, he enjoys playing with robotic toys.

CompuServe — 71266,46

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That's how it is now. Soon, I'll have to disassemble it all, pack it carefully and attempt to recreate everything in the new house. On the bright side, here's my big chance to finally organize it all into the epitome of efficiency. I'll let you know how it turns out.

New joystick.

There are dozens of joysticks to choose from; there must be *one* to satisfy every technical, aesthetic or novelty whim a gamer might have. At first blush, it seems the last thing this world needs is yet *another* new joystick. Nuclear arms reduction, the cure for the common cold and maybe a good five-cent cigar are higher on my wish list, for sure. But if you're a sucker for every new joystick that comes along—or if you want a fast-acting high-score stick—the new **500XJ** from Epyx is worth a look. For a complete review of it, check issue 50's **Panak strikes!**

First of all, the **500XJ** is for "righties" only. The left hand cradles the base of the stick, with the last two fingers fitting snugly into a cutout portion of the stick. The fire button is sculpted on the right side of the stick, exactly where your index and middle finger wrap around.

The **500XJ** is billed as the world's first high-performance joystick. Epyx would have you believe that we are talking Ferrari, Lotus and Formula One here. And they may be right. In hours of hands-on use (how else would one use a joystick?) I found the **500XJ** to be a solid performer. Consistently high scores were attained and minimal fatigue was encountered.

With its five-year warranty and workmanlike quality, the Epyx **500XJ** is now one of my favorite sticks.

Documenting documentation.

People often ask me what I find the most important quality for a computer program to have. The first thing I usually tell them is that it should meet their needs—for whatever they want to do. Only you can decide if a program has the features you'll need to accomplish a particular purpose. The second most important aspect of any program is its documentation. Though this may sound like a hackneyed cliché, a program is only as good *to you* as it is easy to use and understand. Docmentation is the key that will unlock the power of your program.

The three components of good documentation are thoroughness, accessibility and friendliness. Thorough documentation means that *all* of the information you need to operate the program is provided. The manual should contain and describe any setup, data input, reporting, output, option setting, and other procedures. Special emphasis should be placed on explaining unique words or concepts, so that the user can always understand what the program is doing.

A user wants to believe that he's in control of the program at all times. Understanding how the program works and what is expected of the user goes a long way toward allowing him to maintain that control. Every section of the documentation should include introductory material explaining what will be covered. Next comes the detailed information itself. A summary should come last, to recap the previous material—as well as to tie it in to what will follow.

Documentation thoroughness also includes *how* the information is presented. Most programs for the Atari ST and 8-bit computers come with one user manual. In some cases, this may be sufficient. However, it may also be appropriate to include a separate quick reference guide, with abbreviated descriptions of operating procedures and concepts. Further, on-line help is often very useful for both the novice and the experienced user. The best type of online help is contextual in nature, meaning that the information provided by the program relates to what the program is doing or requesting at that time. References to manual page numbers where more complete information may be found are also helpful, but this rarely occurs.

Good computer documentation is also accessible. In other words, you should be able to find exactly what you're looking for in the manual or quick reference guide. Accessible documentation implies good organization. Indeed, one of the most frustrating things I've experienced when learning a new program is *not* being able to find the instructions for a particular procedure. It's even more infuriating when I remember reading it, but, somehow, just can't seem to find it.

One of the best ways to make a manual accessible is to provide an index. Newcomers to the world of computing are continually amazed at the number of program manuals that *don't* contain an index. With the exception of a game program or simple utility, how is one expected to navigate through the sea of information without a map? The index, together with a good table of contents and manual organization, is the map.

Often, providing an index may not help. I still occasionally fall into the "dictionary trap" when trying to figure out how a program works. We're all familiar with this: you try to look up the spelling of a word in the dictionary and, because you have no idea whatsoever of how the word is spelled, you can't find it. With computer programs, menu maps and flow diagrams can be provided to help overcome this problem.

Finally, user documentation should be friendly. By *friendly*, I mean that the user must be able to understand and apply what the author has provided. The user is more frequently looking for answers about *what* to do, rather than *why* they should do it. If the author anticipates this "what need," then the writing can be more understandable to the user.

Friendly also indicates *good* writing. Short sentences written in the active voice are easier to read and understand than those in the passive voice. Flowery language, poor structure and grammar, and long sentences will slow the reader *down* and decrease comprehension. Information flow can also be made more effective by providing tables of data for those times when the user needs to choose from many options.

Not to be ignored is the appearance of the documentation. One of the easiest ways to increase readability and comprehension is to control the spacing between letters, words, lines and paragraphs. Appropriate amounts and use of this "white space" can aid the reader in searching for information, since the text *looks* more organized. Print enhancements (such as underlining, bold face, italics and uppercase letters) can call attention to important words and concepts. However, if overused, these will actually slow the reader down. Good use of headings and labels will add to the overall readability of the document.

It's easy to see that good documentation—thorough, accessible and friendly—can greatly aid the user's understanding and use of a program. Of course, quality documentation, like any other quality product, requires more time to create and is therefore more costly. If a software company expects you to purchase their program, you have a right to understand how to use it. A program that meets your needs but is difficult to use is no better than a program that doesn't meet your needs at all.

BATTLE STATIONS!

Strategic tips for armchair commanders.

by Daniel A. Silvestri

Historical simulation games loom dominant on the gaming scene, just behind their adventure counterparts. Every one of us likes the opportunity to either escape reality through an adventure, or recreate reality through an historical battle simulation game that offers us the chance to rally our troops to ultimate victory and to out-strategize the most worthy of opponents from actual battles in history. Battle simulations are among my personal favorites, but often the simulations are so good they can easily frustrate the armchair generals of the gaming world. From the annals of my personal battleplans, here are some tips to assure a fair shot at victory on any battlefront!

After having spent many long hours maneuvering my troops on my monitor, I discovered that the unseen commanders hidden behind enemy lines in these simulation games are cold-blooded, relentless, and have a driving force that will crush any weak-hearted general right where he stands. These unseen generals are strategic geniuses, who can only be stopped by an opponent with even greater ability. Please attend the briefing session which follows, to learn how to win computer battles and enjoy these fantastic games of wit and strategy.

Intelligence report.

There's a myriad of battle simulation games on the market. Some of these are tremendously successful in recreating a "feel" for the battle, through carefully written documentation and excellent on-screen presentation of the battle scene. Chess, one of the original battle games, depends upon pure skill, and challenges the minds of those who play. Similarly, some of the best battle simulations depend very little on luck and very heavily on skillful execution of plans. In short, they challenge your brain. The key to success lies in your ability to *think*, not in your ability to move a joystick or in your hand-eye coordination.

Problem-solving skills are needed, as well as an ability to plan and to manage many different fronts simultaneously. It's really like playing several chess games at once, but with a much broader battlefront scope to track. Therefore, when you lose a battle, *you* alone have engineered it and *you* alone must face the fact that your mental skills need honing. Lady Luck does not play the lead in these games; the brain must triumph.

It took me a long time to realize the true nature of these battle games and learn how to become a worthy adversary of those hidden enemy commanders. The first trick is to play the game. That sounds simple enough, but if you play one of these games and get trounced, you may never play again—never get to enjoy the potential that's truly there. So, on to the next part of the briefing.

The battle game: a field report.

Everyone who enjoys a mental challenge should try one of the battle simulation games. They're good for adults and older kids, too, because they really teach organizational and planning skills, and provide a forum for mental gymnastics.

The selection of battle simulation games is growing wider and wider. Many fine game companies are producing superb games in this category. Within the category, there are several different types of games. Some simulations are recreations of a single, specific historical battle (for example, **The Battle for Normandy** from Strategic Simulations, Inc.) Other simulations may include a number of scenarios you can play. Still others let you play a "progressive" game, leading your troops through a variety of battles, while your group's skill increases with each success. Finally, some simulations let you fight a "generic" battle.

The choices range from Roman wars to Viet Nam; from the Civil War to World War II. A new class of "simulations" project themselves into the future, though these are obviously not for history buffs. It's most enjoyable to select a period that interests you. I have a great number of World War II simulations, since that period of history really intrigues me.

Read specific reviews for additional information on the game of your choice, and write to the game companies requesting catalogs that describe their offerings. Whatever you do, try one. And go on to the strategy session which is about to begin.

Strategy session.

Welcome. As I mentioned earlier, you can easily get frustrated with one of these sophisticated battle games. Your enemy is *very* good, so you must be better. Here are some tips from a battle-worn general who has learned the hard way.

(1) There is an easy way to avoid the frustration syndrome. Many games (for example, those from Strategic Simulations) offer the player complete control over various battle factors that affect the play of the game. There may be settings controlling initial enemy strength, troop replacement

arrivals, and so on, that will make the first few games a little easier on you. Historical settings are generally tough and not for beginners; work your way up to them while you're learning how to be successful in battle. Always see what possibilities are available and never start with difficult, frustrating ratings.

(2) Read the rules thoroughly. Know that certain types of terrain affect the outcome of skirmishes. Learn about the various types of units you have under your control: armor, infantry, supply depots, etc. In short, read and reread the rules as a preamble to the actual battles, to better prepare yourself for the real thing.

(3) Clearly define in your mind the objectives of the operation; know the grand scheme, what you must accomplish in order to achieve victory. Scroll over the battlefield and be sure to examine the entire on-screen map, to get a better handle on these objectives.

(4) Define smaller goals as you begin to execute your general plans. Have intermediate objectives that will help you get to your ultimate goal. Patient, well-planned execution of a scheme will get you a promotion to Four-Star General.

(5) Familiarize yourself with the various phases of battle, for example: movement phase, artillery phase, and so on. It's your job to know how your units move, when they need to be supplied, rested, pulled back.

(6) As a general rule, armored or tank divisions should be moved out ahead of infantry for two reasons: the heavier firepower and the fact that tanks move faster than infantry. Let your tanks roll ahead and do the heavy work—your slower units should follow the big guns, not lead them.

(7) Be a good observer. Every successful general has forward field observers to report movement to him . . . be that observer. Watch the enemy troop movement to anticipate where they may be building up for an offensive; look closely at enemy units to see which ones are fatigued and unable to fight. In short, watch the enemy; note whatever you can about them. To be forewarned is to be forearmed.

(8) Advance steadily and watch your perimeters. Don't let the enemy creep behind your front line by sneaking around your flanks. Beef up your vulnerable spots.

(9) Though you want to keep conquering territory and moving toward your objective, know when to fight and when not to. Know when to stop a "game-turn" of battle *before* you wear your troops too thin.

(10) Firepower. Key as much firepower on an enemy unit as possible, and fight only when the odds are definitely in your favor (say 3 to 1, or better). By doing this, you'll continue to win little battles, then the war.

(11) Inspect your troops before every battle in which they will engage. Look at their

vital statistics to see what firepower they can muster, how fatigued they may be, how their morale is holding up. Know your men; know their strengths *and* weaknesses.

(12) Retreat? Sometimes you *must* retreat, regardless of pride. You can rest fatigued divisions, then get them into a later skirmish. Do whatever you can *not* to have a unit wiped out; you lose a lot of points for eliminated units.

(13) Above all, take your time when in a game-turn. The time it takes to complete these simulations varies from game to game, but don't rush your decisions. Make calculated, well-thought-out moves. Know what the potential consequences can be *before* you commit to a skirmish.

(14) Always, but always, know how deep you are into the game. Some scenarios cover a 12-day period (or 12 game-turns), for example. By knowing the time left to completion, you can better pace yourself for the final offensive assault, or the dig-in-and-defend "endgame" tactic.

(15) Speaking of endgames, if you can make it to the end of the game in fairly decent shape, you have a good chance to achieve victory. As many chess programs have weak endgames, so do many battle simulations have the same problem. You'll see the computer commander miss an opportunity here and there in the last turn or two. So hang in there.

(16) Play and save. Because you're quite likely not to finish an entire game in one sitting (though several games on the market only take an hour or so), save your game-in-progress position often, especially near the end. You might want to go back and replay an ending to test out a certain battle tactic. This could give you the opportunity to learn some subtle nuances of the game, without having to start from the beginning again. You can see the difference a move makes.

Your brain is on the line here. Intelligent execution of plans demands that you be observant, hypothesize about potential enemy movement so you can plan for the future, test out tactics and note the results.

You've got the best men in the Armed Forces; their morale is flying high. And you're in command. You've got your objectives. It's up to you to achieve them. As you study the strategic map, you can almost taste victory!

Daniel A. Silvestri taught at a university before turning to sales. Now the Retail Account Manager in Illinois and Wisconsin for Ashton-Tate, a major manufacturer of business software, he enjoys adventure games, personal management and business software.

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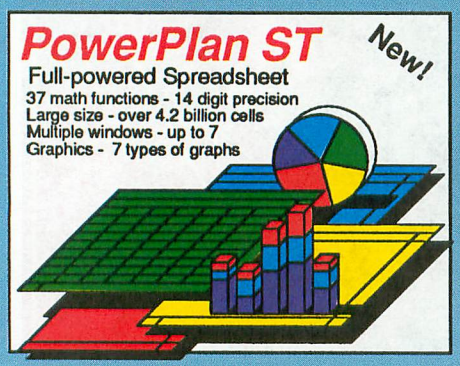

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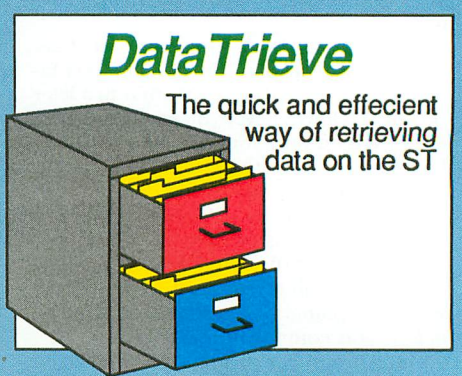

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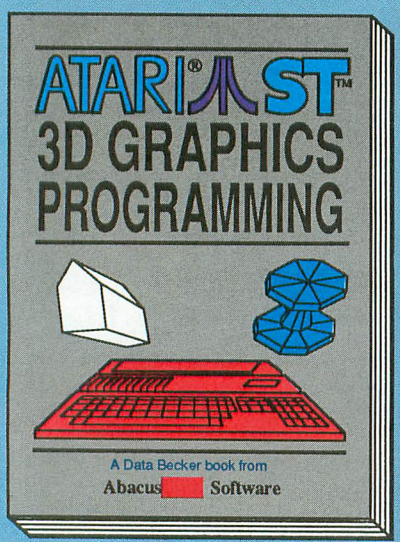

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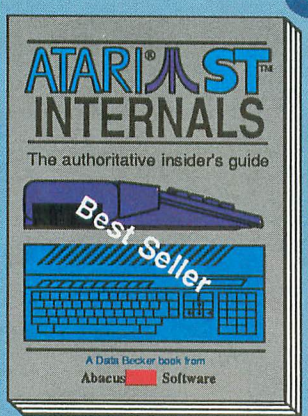

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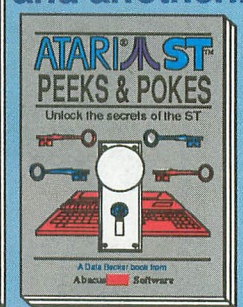

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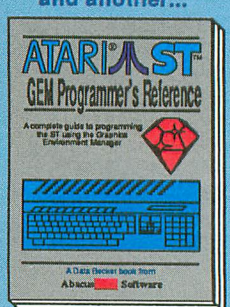

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CIRCLE #130 ON READER SERVICE CARD

ST notes

by D.F. Scott

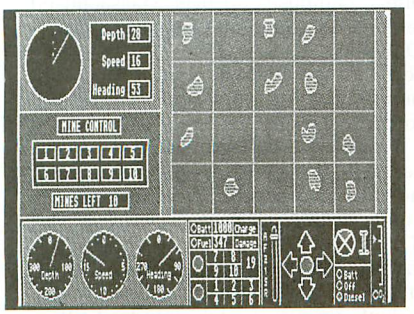
Newsworthy happenings in the ST world.

Software Summary.

It's time once again for us to surface from the depths of whatever ST game we were playing and check out the cream floating atop the sea of new ST software. We have mostly recreational software this month—to make up for the lack of recreational software for the first half of last year.

Spectrum Holobyte

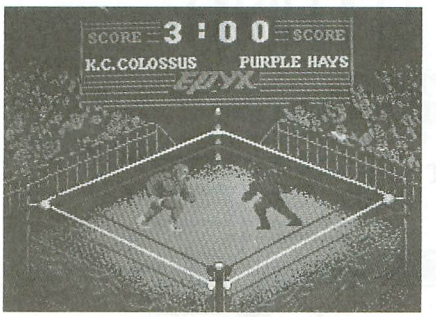
First, the company known for **GATO**, has. . .well, yet again produced **GATO**, but this time for the ST. The real GATO was a class of American submarine in World War II; the game **GATO** is a battle scenario simulator involving that class of submarine in ocean combat. Thirty preplanned scenarios are provided, although, since this is a simulation, the captain can program his own battle scenario, dictating orders from HQ to himself—as well as manipulating the Japanese fleet. The captain, if so ordered, can even set the condition of his ship beforehand. If the ship is to engage in battle while already damaged, the simulator can thus expertly predamage his vessel.



Every battle (and its outcome) is recorded in a permanent captain's log, so the condition of the ship in the previous battle can be carried over into the next, and so on. The real battle on the software shelves is between **GATO** and MicroProse's **Silent Service**. It seems wherever **Service** goes, **GATO** tags along behind, firing torpedoes into **Service**'s popularity. Personally, I think I'll just sit peacefully on a Pacific island and keep score. List price is $49.95. Spectrum Holobyte Inc., 1050 Walnut Suite 325, Boulder, CO 80302 — (303) 443-6191.

Epyx

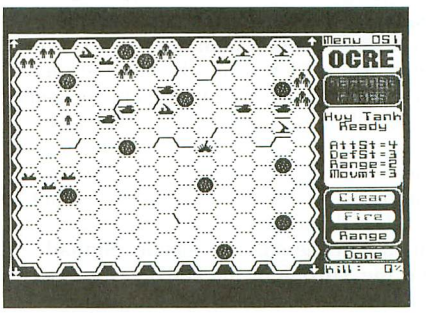
If your idea of battle is more along the lines of Dr. Death vs The Mad Foreigner, then Epyx **Championship Wrestling** is more your cup of tea—or, for that matter, tobacco juice. In a hilariously-animated timed bout, the player bravely places his fighter in the ring with one of eight other brutes, either computer- or human-controlled. Through your joystick, a fighter can make any of twenty-five moves; most of these have names which tell their gruesome tale. Fighting can even take place outside the ring.



I'm usually opposed to needless violence; but if you *need* violence, here may lie the vessel for your anger. The bout I'd like to see is a rematch between Hulk Hogan and John Stassel, the ABC News correspondent whom Hulk beat up in a hallway. The place I'd like to see this bout, though, is in a courtroom. List price is $39.95. Epyx, 1043 Kiel Court, Sunnyvale, CA 94089 — (408) 745-0700.

Origin Systems.

Back to the tactical warfare department. For several years now, there's been a board game—or shall we say a *cardboard* game—by Steve Jackson, called **Ogre**. In it, a modern, highly-equipped fighting force meets a more modern, highly-equipped *single unit*, whose path of destruction is but one step short of vaporizing the planet.



Steve Heuse has brought **Ogre** to the ST—which is quite comforting, since previously we had to play the game with tiny little cardboard cutout squares. Play is on a hexagonal grid. Each piece has a limited range of movement, which lessens with damage. Attacking the weapons batteries may affect attack capability; attacking a vehicle's treads may impede movement; attacking the infantry can cause serious death. Each turn is made up of a movement phase and a firing phase. The objective is for either the army to defeat the **Ogre**, or for it to make the world flat once again. List price is $40.00. Distributed by Electronic Arts for Origin Systems, Inc., 340 Harvey Road, Manchester, NH 03103.

Kuma

If you're interested in playing **Ogre** and **Championship Wrestling** *simultaneously*, a company called Kuma has come up with a utility christened the **K-Switch**, which promises to keep two programs in memory at once, and switch the run-state of both programs on demand. The billing promises to make the switch in one second on a 1040ST. The list price for this utility will be $44.95.

Mindscape

Our software company of the month is Mindscape, which is forging ahead with several promised new releases. Many of these are releases for Cinemaware, a company working to incorporate movie-like plots with arcade-like action. Already available on the Cinemaware

label is **S.D.I.** (Strategic Defense Initiative), whose plot is a cross between a Robert Ludlum novel and a Buck Rogers serial. In it, the KGB has performed a *coup d'état* at the Kremlin and, for an encore, has decided to launch World War III. To save the world, you must keep intact the defense shield over the U.S.—the grand prize being a date with a Russian lovely named Talya (this game assumes an all-male audience).

Cinemaware has promised the release, through Mindscape, of no less than three new titles between now and June. **Defender of the Crown** may be released by press time. In this item, you're a knight (male again) defending the shining city on a hill (again) from barbarian invaders, in the ultimate quest for. . .a date with the Princess. In **The King of Chicago**, due for release in April of '87, you run one of the mobs—and I wouldn't doubt there's a dame or two to be picked up. Finally, in the summer sleeper **Sinbad and the Throne of the Falcon**, you may as well be Victor Mature. And, who knows, perhaps Susan Hayworth has a cameo.

I wonder when they'll think of a game where you get to be Kelly McGillis or Debra Winger. Perhaps Gloria Steinem will have an influence upon that decision.

Anyhow, Mindscape also has its own product line, of course—and for the ST—that will soon include a mind-boggling program called **Balance of Power** by Chris Crawford. You'll remember Mr. Crawford as one of the masters of computer game design, and as the creator of **Eastern Front 1941**.

Balance of Power, however, is *not* to be a tactical wargame; instead, the scenario takes you away from the battlefront and seats you very uncomfortably at the negotiating table, as President of the United States. You see, you're negotiating with the Soviet Union, which has suddenly gone off the deep end. Its representatives must be thinking that Gorbachev's peace plan was something they once read on the back of a cereal box. You have control over *all* the armed forces—the State Department, the National Security Agency, *and* the CIA—normally an impossibility. In this game, the level of control you exert is proportionate to your personal stamina.

Without a Col. North to come to your aid, you become involved in the most intense negotiations ever to be simulated on a micro. (Fans of the game Diplomacy, rejoice!) This is no "1=Peace, 2=War" negotiation, either. Your game can last for *days, weeks*, literally.

You set the summit dates, *you* go to Reykjavik, *you* have to remember the difference between a TOW *missile* and a tow truck. You only have *four years* to achieve a lasting peace; that is, unless you're re-elected, which depends upon whether the public likes you or not. That's right, during all this, you have to maintain a heroic image with the electorate—and your party.

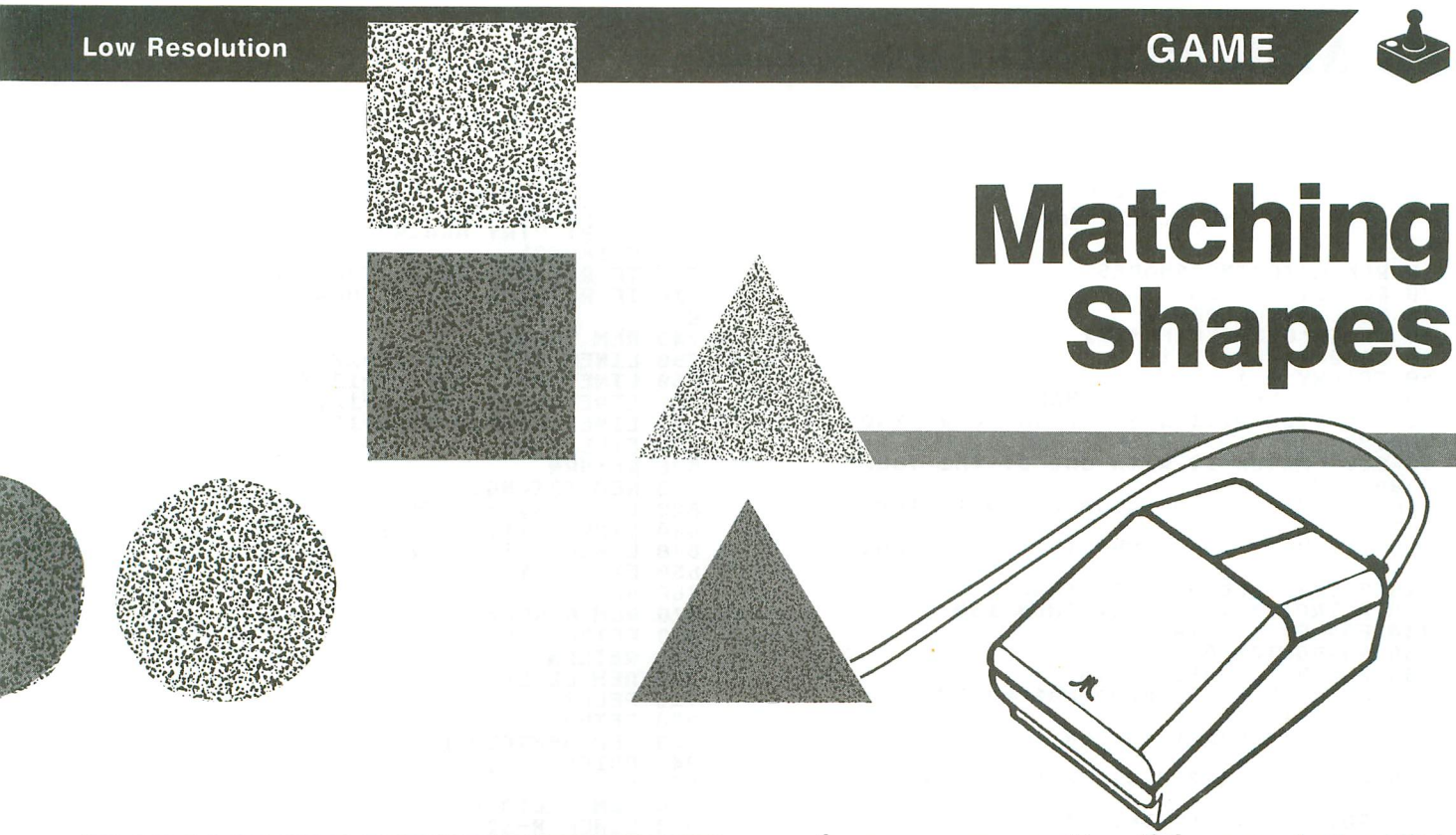
This game has taken off like an ICBM on every machine it's ever been written for; the ST version should be no exception. Projected list price is $49.95. Mindscape, 3444 Dundee Road, Northbrook, IL 60062. //

The Bug, the Bug, the Computer Bug!

Finally, what may very well be the first *ST-only* computer store in America is opening in Amherst, Massachusetts. University of Massachusetts students Mike Cohan and Rick Flashman, joint chairmen of the Western Massachusetts ST Users' Group, are opening The Computer Bug, they hope, in mid-January '87—which means, by press time, it should already be open.

Mike Cohan tells us, via satellite through Group Atari over the Delphi network, that he feels the level of enthusiasm generated over the ST on college campuses all over Massachusetts, warrants the opening of such a store. "Our plan," Cohan writes, "is to push the ST to the students around here as a combination ultra-low-cost terminal and word processor. Our advertising plan is to blanket five colleges [in Massachusetts] with flyers and posters, and to set up booths in the student centers of the colleges, showing off the ST."

Adds Cohan, "Eight hundred fifty dollars for a 520ST and modem, when students are paying two hundred fifty per semester to *rent* a terminal, will look pretty darn good to a lot of students out there (we hope)!" We'll keep you informed as the Bug progresses. //



Matching Shapes

by Regena

The Atari ST is not just for adults! Children can also enjoy the computer. **Matching Shapes** is a program written in ST BASIC that offers exercises in a prereading concept for young children. The program works in low resolution only.

One of seven shapes is chosen randomly and appears at the top of the screen. Four more shapes are shown. To match the shape, you must move the mouse arrow to the correct shape and press the left mouse button.

If the answer is incorrect, there is an "uh-oh" sound and you must try again. If the answer is correct, three asterisks appear under the matched shape and an arpeggio is played.

There are ten problems. After the quiz a tune of random notes is played, and you have the option of trying again. Press *Y* for yes—try again; or *N* for no—end the program.

The seven shapes are drawn using subroutines in Lines 740-1100. I used PCIRCLE, PELLIPSE and LINEF with FILL commands to draw the shapes. You can change these shapes or add your own.

Line 180 assigns a random shape number to S. Line 190 assigns a random color number to C. Lines 200-210 draw the shape at the top of the screen. Lines 220-270 draw and number the four boxes for the shapes to be matched.

Line 280 randomly assigns the correct answer to A, which will be 1, 2, 3 or 4. X and Y are coordinates used in drawing the shapes. The FOR-NEXT loop with J as a counter in Lines 290-410 draws the four shapes to be matched, randomly choosing the shapes and making sure each is used only once. The shapes are drawn in random colors. When the counter J is equal to A, the matching shape is drawn; otherwise a random shape is drawn.

Line 420 sounds a prompting tone. Lines 430-470 check the mouse arrow position. If the mouse button MB is pressed, then the coordinates are MX and MY. Lines 460-470 make sure those coordinates are within the four boxes for the shapes shown. Line 480 returns a formula for G, the number guessed, depending on the MX coordinate. Line 490 draws an arrow under the shape chosen.

Line 500 checks the answer. If the answer is incorrect, then Lines 510-550 play an "uh-oh" sound, erase the arrow showing the choice and return for another choice. If the answer is correct, Lines 560-630 draw the three red asterisks under the correct shape, play an arpeggio and pause before the next problem. Lines 650-680 play a tune of twenty-five random notes when ten problems have been solved.

Once the basic shapes have been mastered, you can change the program to draw other shapes. You may wish to have the child match uppercase letters, uppercase to corresponding lowercase letters, or words. Words could be matched to definitions, foreign words to English translations, historical events to dates, etc.

If you prefer to use the keyboard to play the game instead of pointing with the mouse, change the user instructions in Lines 100-110 and replace Lines 430-480 with the following lines.

```
430 G=INP(2)
440 IF G<49 OR G>52 THEN 420
450 G=G-48
```

Whichever you prefer, **Matching Shapes** will make child's play out of this learning experience.

Regena got her first home computer (T1-99/4) for Christmas in 1980. Ideas for the hundreds of BASIC programs she's published (for various computers) come from her six children. A regular columnist in COMPUTE!, *her latest book is* Elementary ST BASIC, *from COMPUTE! Publications, Inc.*

Listing 1.
ST BASIC listing.

```
10 REM MATCHING SHAPES
20 REM BY REGENA
30 FULLW 2:CLEARW 2
40 MH=GB:G2=PEEK(MH+12)
50 COLOR 1,0,1,1,1
60 GOTOXY 0,1
70 PRINT "** MATCHING SHAPES **"
80 ?:? "You will see one shape at the
top."
90 ?:? "Match it with one of the four
shapes."
100 ?:? "Move the mouse arrow to the s
hape"
110 ?:? "and press the left mouse butt
on."
120 ?:?:? "Press F1 to start."
130 R=INP(2):IF R<>187 THEN 130
140 FOR P=1 TO 10
150 RANDOMIZE 0
160 CLEARW 2:GOTOXY 0,0
170 PRINT "Which shape matches?"
180 S=INT(7*RND+1)
190 C=INT(8*RND+1):COLOR 1,C,C
200 X=148:Y=32
210 ON S GOSUB 750,820,880,910,940,970
,1040
220 GOTOXY 7,13:PRINT "1       2
 3       4"
230 LINEF 34,60,290,60
240 LINEF 34,140,290,140
250 FOR YB=34 TO 290 STEP 64
260 LINEF YB,60,YB,140
270 NEXT YB
280 A=INT(4*RND+1):X=2:Y=100
290 FOR J=1 TO 4
300 X=X+64
310 C=INT(8*RND+1):IF C=PC THEN 310
320 PC=C:COLOR 1,C,C
330 IF J<>A THEN 350
340 K(J)=5:B=5:GOTO 400
350 B=INT(7*RND+1):IF B=5 THEN 350
360 IF J=1 THEN 390
370 FOR L=1 TO J-1:IF B=K(L) THEN 350
380 NEXT L
390 K(J)=B
400 ON B GOSUB 750,820,880,910,940,970
,1040
410 NEXT J
420 SOUND 1,15,10,5,2:SOUND 1,0,0,0,0
430 GEMSYS(79)
440 MB=PEEK(G2+6):IF MB=0 THEN 430
450 MX=PEEK(G2+2):MY=PEEK(G2+4)
460 IF MY<80 OR MY>160 THEN 420
470 IF MX<34 OR MX>290 THEN 420
480 G=INT((MX+30)/64):GOTO 490
490 GOTOXY G*7,14:PRINT CHR$(1)
500 IF G=A THEN 560
510 SOUND 1,15,5,3,2
520 SOUND 1,15,1,3,2
530 SOUND 1,0,1,1,1
540 GOTOXY G*7,14:PRINT " "
550 GOTO 420
560 GOTOXY G*7-1,15:COLOR 2
570 PRINT "***"
580 SOUND 1,15,1,4,3
590 SOUND 1,15,5,4,3
600 SOUND 1,15,8,4,3
610 SOUND 1,15,1,5,6
620 SOUND 1,0,1,1,0:COLOR 1
630 FOR D=1 TO 1000:NEXT D
640 NEXT P
650 FOR N=1 TO 25
660 SOUND 1,15,INT(12*RND+1),5,2
670 NEXT J
680 SOUND 1,0,1,1,0
690 CLEARW 2
700 PRINT "TRY AGAIN? (Y/N)"
710 R=INP(2)
720 IF R=89 OR R=121 THEN 140
730 IF R=78 OR R=110 THEN 1120 ELSE 71
0
740 REM SQUARE
750 LINEF X-12,Y-12,X+12,Y-12
760 LINEF X+12,Y-12,X+12,Y+12
770 LINEF X+12,Y+12,X-12,Y+12
780 LINEF X-12,Y+12,X-12,Y-12
790 FILL X,Y
800 RETURN
810 REM TRIANGLE
820 LINEF X,Y-12,X+12,Y+12
830 LINEF X+12,Y+12,X-12,Y+12
840 LINEF X-12,Y+12,X,Y-12
850 FILL X,Y
860 RETURN
870 REM CIRCLE
880 PCIRCLE X,Y,15
890 RETURN
900 REM ELLIPSE
910 PELLIPSE X,Y,16,8
920 RETURN
930 REM SEMICIRCLE
940 PCIRCLE X,Y+8,15,0,1800
950 RETURN
960 REM RECTANGLE
970 LINEF X-12,Y-6,X+12,Y-6
980 LINEF X+12,Y-6,X+12,Y+6
990 LINEF X+12,Y+6,X-12,Y+6
1000 LINEF X-12,Y+6,X-12,Y-6
1010 FILL X,Y
1020 RETURN
1030 REM HEXAGON
1040 LINEF X-6,Y-12,X+6,Y-12
1050 LINEF X+6,Y-12,X+15,Y
1060 LINEF X+15,Y,X+6,Y+12
1070 LINEF X+6,Y+12,X-6,Y+12
1080 LINEF X-6,Y+12,X-15,Y
1090 LINEF X-15,Y,X-6,Y-12
1100 FILL X,Y
1110 RETURN
1120 CLEARW 2
1130 END
```

ST CHECKSUM DATA.
(see page 33)

```
 10 data  964, 11, 516, 605, 1, 608, 7
, 6, 295, 367, 3380
 110 data  946, 42, 580, 975, 864, 839
, 968, 179, 592, 687, 6672
 210 data  681, 595, 339, 540, 154, 60
7, 516, 335, 848, 146, 4761
 310 data  239, 521, 359, 811, 992, 89
, 205, 297, 114, 631, 4258
 410 data  274, 115, 721, 0, 766, 550,
 546, 494, 796, 101, 4363
 510 data  248, 243, 80, 226, 408, 205
, 621, 265, 276, 257, 2829
 610 data  256, 92, 120, 299, 3, 706,
296, 95, 403, 426, 2696
 710 data  407, 460, 558, 879, 393, 39
2, 393, 400, 485, 344, 4711
 810 data  51, 91, 383, 103, 475, 362,
 839, 234, 371, 935, 3844
 910 data  640, 352, 335, 116, 361, 25
2, 211, 206, 205, 139, 2817
 1010 data  553, 439, 985, 67, 951, 27
, 58, 956, 42, 555, 4633
 1110 data  441, 535, 917, 1893
```

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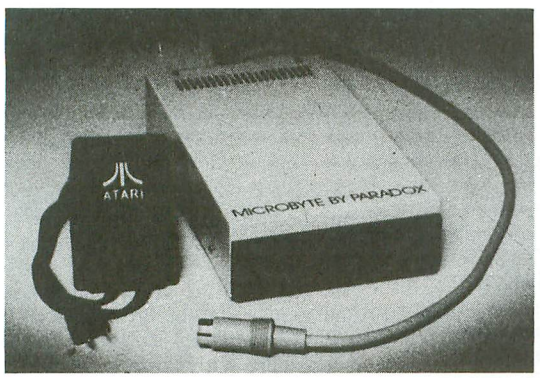

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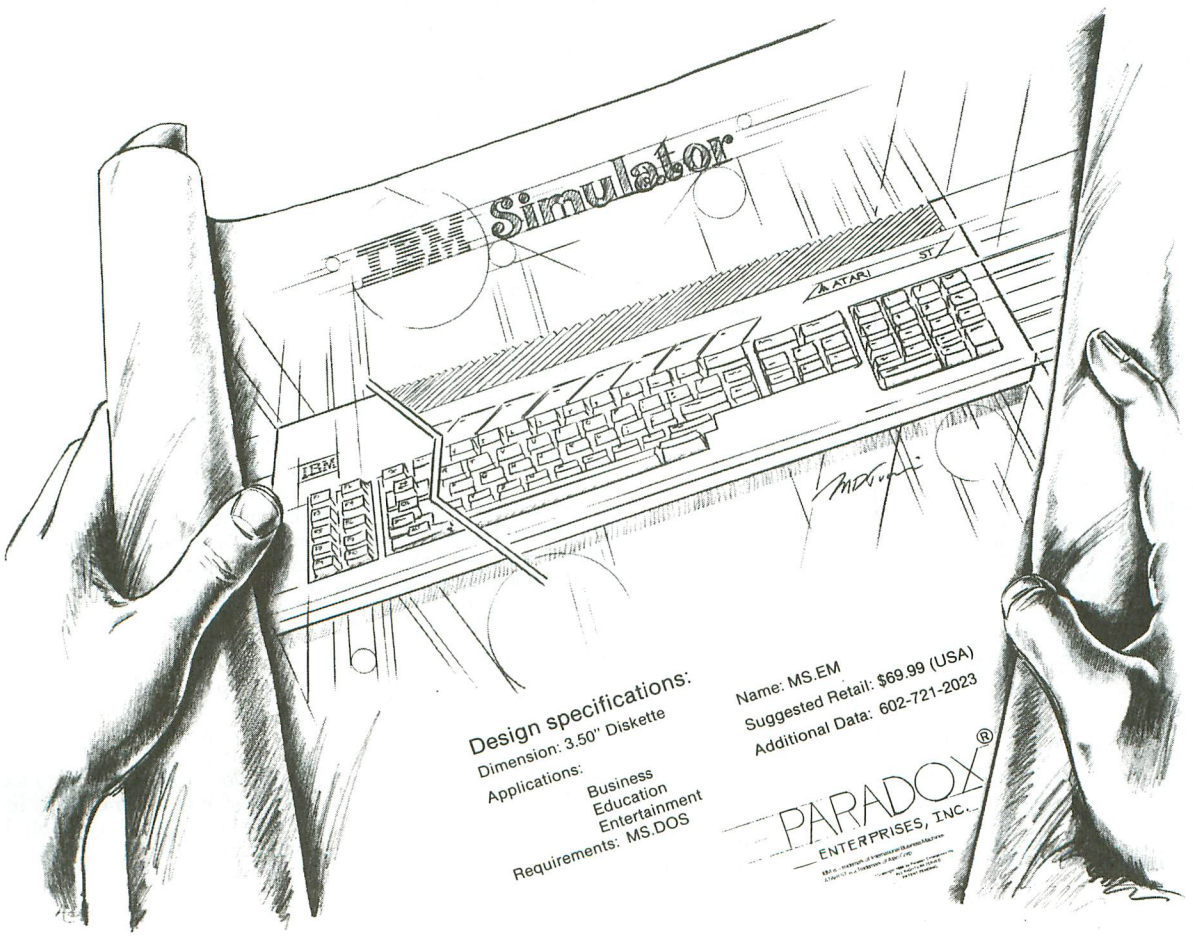

Atari ST Tricks and Tips

ABACUS SOFTWARE
P.O. Box 7129
Grand Rapids, MI 49510
(616) 241-5510
260 pages and index $19.95

by Matthew J.W. Ratcliff

Atari ST Tricks and Tips (called ***T&T*** hereafter) is the fifth book in a series of programming tutorials and reference manuals from Abacus. There are four main sections, devoted to ST BASIC, utilities, color printer graphics and GEM programming.

The first section begins with an overview of the more unusual ST BASIC commands. A few of the language's bugs are documented here, with hints on circumventing them. At the top of page 12, ***T&T*** states that since ST BASIC "sends the CR/LF after every 72 characters, we get some really messed up graphics." It fails to mention that the WIDTH command eliminates this problem. A helpful discussion of sound and graphics functions comes next. Use of VDISYS and GEMSYS commands is explained. The section finishes up with a discussion of the CALL function, which allows you to add your own machine language routines to ST BASIC programs.

The next section, on utilities, introduces interrupt processing by way of presenting an assembly language program that continuously displays the current time on your desktop menu bar. Two versions of the program are given, one in assembly language source code, the other a type-in ST BASIC loader.

These program listings bring me to my biggest complaint about this (and previous) Abacus books. The listings are typeset copies, rather than direct reproductions of the original source listings. Even with the best proofreading, typos will creep in with such a system, and Abacus does not employ the best proofreaders. If you aren't well versed in assembly language, many of these errors will go unnoticed until assembly (or, in the case of C listings, further on in the book) compile time. Second, the choice of font for the listings was unfortunate. The lowercase letter *l* looks identical to the numeral *1*. In most cases, it's easy to tell the difference from the context, but this isn't always true. Again, the problems won't be apparent until you have typed it all in and start getting errors.

The **T&T** utilities section also covers printer spooler and RAMdisk utilities. Assembly source listings are given. The section concludes with a brief comparison of assembly and C programming on the ST, with an equivalent sample provided for both languages.

Color printer hard copy is the subject of the third section. Utilities, written in assembly, are listed for dumping color screens to a JX80 (a color dot-matrix printer, no longer manufactured) and the HI-80 pen plotter, both made by Epson. An in-depth explanation of bit-mapped screen memory is included.

The final section of ***T&T*** introduces you to GEM programming, with an overview of both the VDI and AES. Sample programs are given in BASIC and C. The use of resource files is explained in detail. A tutorial on creating .RSC files with the developer's kit Resource Construction Set is very helpful. Finally, there's a good example (in C) of writing a desk accessory, namely a color printer driver for the JX80.

If you prefer to learn by example, you'll get a lot out of this book. Many complete assembly and C listings are given, with plenty of comments. There's also an index, something lacking in some of the previous efforts from Abacus. For those without assemblers or compilers, the programs are also listed in the form of BASIC loaders, which will create the program files for you (after you type them in). Finally, if the typing is too much effort, a program disk is available from Abacus for $14.95.

I found the ***T&T*** tutorials on the Resource Construction Set editor and accessories particularly helpful. There are typos, but, it seems, not nearly as many as in earlier Abacus publications. I found the listings in this manual very instructive as I was learning ST assembly language programming.

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Softworks BASIC

SOFTWORKS LIMITED
2944 N. Broadway
Chicago, IL 60657
(312) 975-4030
All resolutions $79.00

by D.F. Scott

Softworks BASIC is a compiler, not an interpreter. Using it to write a program is like using any other compiler, except that the result of your efforts is not a .PRG or .TOS file. The compiler program on the single disk provided takes straight ASCII text from any editor (for example, **1st Word** in non-word-processing mode) and generates intermediate code which is neither machine code nor BASIC. This file, saved with the extension *.RUN*, can be executed using the proprietary "runtime system" (another program) provided on the disk.

The runtime system only allows the execution of a complete program, from beginning to end, or to a break point. Making changes requires going back to the text editor, then recompiling the entire program. To have to go through all this and still not be able to produce stand-alone code, linkable to C or machine-code routines, is a major flaw in an otherwise well designed system.

Softworks makes up for this by providing a powerful set of BASIC commands. These include: the OPEN # and CLOSE # file-manipulation commands for both random and sequential access formats, ON ERROR trapping, PRINT USING output formatting, and much of the familiar arithmetic library; however, you can't define functions with DEF FN.

But the major difference in the **Softworks BASIC** implementation lies in the optional modular structure available to the programmer. Scrolling through the examples provided, I thought at first that I had the wrong disk. Lowercase! Nested statements! Module labels! And the line numbers are missing! is someone trying to turn my language into Modula-*3*?

Alphanumeric labels, with apostrophes as word separators, can replace line numbers in all branch statements, conditional or not (as in *GOTO help*). Line numbering is still available as an option. (I am an incurable line-numberer.) Statements can be freely indented, but a statement continued to the next line must end with an ampersand (*&*). The compiler is case-sensitive: *S* and *s* are different variables.

A major innovation is the MAP statement. It replaces memory allocation statements (CLEAR and OPTION RESERVE), variable initialization statements such as DEFINT, and string concatenation expressions such as *A$=B$+C$*. By putting a variable MAP at the start of a program — about where you'd put your DIMs—you can create up to a sixteen-level data structure (similar to typedef struct in C), within which higher-numbered variables are declared to be members of lower-numbered "superior" variables. For instance, if I were to declare a list (called GM$) of great magazines, I would map it with precedence 1 like this:

```
MAP1 GM, S, "Great Magazines: "
```

I could then map two "subordinate" variables within GM$ like this:

```
MAP2 M1, S, "ANALOG"
MAP2 M2, S, "ST-Log"
```

If I really wanted to butter up my employers, I could MAP3 all of the great writers for these magazines, and so on. The *S* (second operand) in each statement stands for "string," used in storing alphanumeric data. *F* would be used for a floating-point variable, or *B* for a binary or integer variable. The contents of the variable GM$ as declared above are: *Great Magazines: ANALOG ST-LOG*. If I were to make any changes in M1$ or M2$, GM$ would be changed too. I might also never be published in these pages again.

About the DIM statement: you can dimension array variables in **Softworks BASIC** up to seven levels. *Seven!* Think of it —a *seven-subscript variable*. For me, this is seventh heaven.

Softworks BASIC also offers the familiar PRINT USING, with this enhancement: the runtime system ignores characters between backslashes (which denote the limits of an alphanumeric field in a USING formatter string). One can label a field, as in *\---title---*, and only the backslashes will be recognized—a real convenience for the eyes. New functions such as LTRIM and RTRIM, which "shave" the leading or trailing spaces on a string, are distinctively BASIC-ish.

I'd like to pin a medal on whoever created the concept of direct access to a block of characters within a string. In **Softworks BASIC**, each character is indexed twice, from both the left *and* right sides. Indices from the right are denoted by a negative sign. So if M1$ equals *ANALOG*, then M1$ [4,-1] equals *LOG* and M1$ [-3, 6] equals *LOG*—third character from the right to sixth from the left. Any time you reference a string—except on the left side of an assignment statement—you can use the two "subscripts" within square brackets to reference a substring. This replaces LEFT$, RIGHT$ and MID$, although these are still available.

One of the major assets of this imple-

mentation may also be a drawback. **Softworks BASIC** allows full access to GEM (both the VDI and AES), as well as to BIOS, XBIOS and GEMDOS commands. This is certainly an advantage over its competitors. But in a language which otherwise gives the programmer abundant, even redundant, methods of data control—the string-manipulation facilities are a prime example—it seems odd not to have a back-up set of good old BASIC graphics commands.

Currently, all pixel-oriented graphics commands are passed to the VDI through the TOOLBOX command, followed by the standard-form GEM call with its *multitude* of parameters as specified by Digital Research. These commands comprise the most powerful graphics tools in computing today, but *they are not BASIC*. They aren't easy to learn and they're hard to keep track of. GEM commands in BASIC look like German footnotes in *USA Today*.

The sample filled-ellipse-drawing program provided on the distribution disk (a translation from a C routine from the Abacus *GEM Programmer's Reference*), with all its MAPped variables and ten TOOLBOX commands, is forty-eight lines long at one statement per line. A filled ellipse on the ST BASIC interpreter requires only the PELLIPSE statement with its arguments—one line. As I've said before, BASIC programmers are tinkerers. Among other things, they. . .excuse me, *we* like to tinker with graphics. Tinkering with the VDI is a lot like trying to shuffle cards with chopsticks.

The only commands **Softworks BASIC** offers that are even graphics related are in the cursor-control department, where you use the TAB statement with two parameters, the first a negative 1. For instance, to move the cursor one row up, you use TAB (-1, 3). There is no direct control over cursor position like that offered by the POSITION statement in Atari 8-bit BASIC—only *relative* control.

A **Softworks BASIC** program can load and then pass control to another program through the CHAIN statement. Any calls to external machine-code or to compiled stand-alone routines—which must have names of six letters or less—are implemented by XCALL; each argument in its parameter list must be saved in an argument stack in memory and must be 10 bytes long.

Softworks also borrowed the ++INCLUDE statement from the C preprocessor; it reads source code from a specified file into the file being compiled. No nested ++INCLUDEs are allowed.

How compatible with ST BASIC is **Softworks BASIC**? In other words, can you develop a program with ST BASIC's interpreter, then compile the final version—without major changes—with **Softworks BASIC**? If the program consists of standard, mathematically-oriented BASIC, the answer is a qualified yes. "Standard" FOR-NEXT, IF-THEN-ELSE, and even WHILE-WEND statements won't need any translation. Of course, you'll have to use line numbers in ST BASIC. If you're using the random number generator, you'll have to edit the "dummy argument"—**Softworks BASIC** prefers RND(0), the interpreter RND(1).

Extra keywords I've found that **Softworks BASIC** supports: FACT(X) returns the factorial of X (*1*2*...*X*). RAD50 (*A$*) returns a packed string that occupies only about two-thirds of the memory occupied by the unpacked string. SIGNIFICANCE sets the number of digits displayed after the decimal point. Finally, there are the BYTE, WORD and LONG functions, which replace PEEK and POKE. These functions act as if they were 1-, 2- and 4-byte variables, respectively. To read the value of memory location X into A, for instance, you'd use *A=BYTE(X)*; to set the contents of location X to value A, you'd use *BYTE(X)=A*. To move N bytes from location A to location B (a block move), **Softworks BASIC** provides *BYTEMOVE(A,N)=BYTEMOVE(B,N)*.

What would a BASIC review be without benchmarks? Remember *Creative Computing*'s "David Ahl's Simple Benchmark"? (Remember *Creative Computing*?) The benchmark would increment variable N from *1* to *100* by ones, forcing BASIC to square-root N ten times and then square it back ten times, keeping track of any deviation from the original value of N—while continually getting a number from the random number generator.

I tried the Ahl benchmark on both **Softworks BASIC** and the ST BASIC interpreter. **Softworks BASIC**'s compiled eleven-line benchmark took eighteen seconds to run, and rooted and resquared with a deviation in accuracy of only .000003. ST BASIC ran the benchmark in *ten seconds*. This is not a typo. Several repetitions gave the same result. But what price speed? The interpreter scored an accuracy mark of .0974731—32,491 times less accurate than the **Softworks** result. To give you a basis for comparison: *Creative Computing* benchmarked Atari 8-bit BASIC at 6:48 minutes, with an accuracy of .012959—still 7½ times more accurate than ST BASIC.

Test 2 in my diathlon is the Sieve of Eratosthenes, a timed trial which "sifts" the prime numbers from a sea of mild-mannered integers, and does so ten times just to be mean. **Softworks BASIC** found 1900 primes in 6:53 minutes. ST BASIC found only 564 primes before running out of space in which to DIMension a variable; and it took 4:09 minutes just for that task. At this rate, had ST BASIC gone the distance, it would have taken about 16:20 minutes to find 1900 primes.

Then there's the *real* competition: The Sieve, compiled with ST **Lattice C**, found 1900 primes in just under *six seconds*.

Which leads me to my final question: what price BASIC? Is it worth the convenience of a legible, freely structured language if the "compiled" results are that much slower?

My answer is. . .well, yes. BASIC is the closest thing right now to the "real" programming language I dream of, and—for the most part—**Softworks BASIC** is another step forward in *its evolution*.

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Dumpmate

A screen dump utility for the Okimate 10 printer.

by Arthur F. Horan

I own an Okimate 10 printer, and I've found it to be a versatile and useful peripheral for my Atari 800. Not only does it offer color printing at a very affordable price, but it also has other interesting features, such as repeat graphics and the ability to print on plain or thermal paper, or even on acetate.

Unfortunately, although it comes with software for doing color printouts of **KoalaPad** and **Super Sketch** screens, it doesn't provide anything for doing black and white printouts of graphics screens (known as "screen dumps"). Furthermore, even though it has a nine-element print head, the Okimate only uses seven of the units to print graphics. Other popular graphics-capable printers use eight pins for their graphics, so existing software designed for them will not work properly on the Okimate 10.

None of this bothered me for the first few months that I had my Okimate. I was too busy printing out program listings and other text files. Sooner or later, though, I knew I would have to figure out how to do graphics on my new whiz-bang color printer, especially since I was working on a multimodal drawing program (alas, still unfinished).

Then I discovered Tom Hudson's **Solid States** 3-D plotting program from **ANALOG Computing**'s issue 16. Two days later I had written two screen dump programs, one for vertical and the other for horizontal printouts. Both were written in Action! To my consternation, the horizontal printout distorted the overall proportions of the picture to a noticeable degree. There are ways to compensate for this (the variable line-feed feature could probably help here), but so far I haven't made the effort. The vertical dump looked fine though, so I proceeded to translate that program into a combination of BASIC and machine language.

I still wasn't satisfied. The program took as much time processing the screen as the printer took printing it, even though most of the processing was done with a machine language USR routine. The problem was that I was using the operating system's LOCATE routine to find each pixel and, even in machine language, the LOCATE function takes a while— especially when you have to do 1344 of them for each line of graphics sent to the printer. The solution involved using some tricky machine language offset calculations and bit shifts instead.

Listing 1 is the BASIC version of **Dumpmate.** Be especially careful when typing the data statements, since these contain the machine language routine used to process screen memory. For your convenience, the program includes a simple checksum feature to alert you to most errors in the data lines. But by all means, use the **BASIC Editor II** from issue 47, if you have it. Be sure to save the program to disk or tape before running it.

Listing 2 is the assembly language source code for the machine language USR routine in **Dumpmate.** You do not have to type in Listing 2; it's included for informational purposes only.

Using the program.

This program is designed to work with graphics 8+16 files on disk or tape. These should be standard screen memory files without headers or any kind of file compression. Cassette files should be the continuous type that do not use long gaps between each block of data. However, cassette files which do use the long gaps will work if you substitute AUX=0 for AUX=128 in Line 690.

MicroPainter files will also work, as will uncompressed **KoalaPainter/MicroIllustrator** files (created by pressing INSERT while the picture is displayed—not files saved from the disk menu). Keep in mind that no compensations are made for color, so the resulting printout may appear

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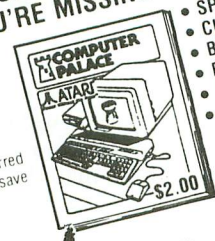

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very different from what was originally on the screen. Using **Dumpmate**'s reverse printing option may help correct such drastic changes. Experiment to get the best results.

When you run **Dumpmate**, you will be presented with a menu which offers the following options:

M — sets the left margin of the picture. You will be prompted to select a number between *1* and *288*. This number represents a displacement in sixtieths of an inch from the leftmost position of the printhead. For example, a setting of *60* would result in a margin 1″ to the right of the standard margin, *150* would be 2½″ to the right, and so on. The default setting is *1*.

D — reads the disk directory.

N — sets the drive number. The maximum value allowed is determined by how you have configured DOS (assuming the normal maximum of four drives allowed with DOS 2.0s). If you only have one drive, you should leave this at its default setting of *1*. The value of *N* is always used for directories and will be used for loading picture files, unless you give a filename specifying a different drive.

R — toggles reverse printing (i.e., white dots on a black background). Reverse printing is normally off.

L — loads a picture file and prints it. See below for a full explanation. The menu displays the current settings for M, N and R, updated each time the menu screen is redisplayed. When the program prompts *YOUR SELECTION?*, answer with the desired option and press RETURN, or press RETURN alone to see the updated menu.

The L option does not require a device identifier and uses the drive number shown on the menu if none is specified. If you are using cassette, you should type *C:* (you *must* include the colon). If you answer the filename prompt by pressing RETURN, you will return to the main menu. Otherwise, **Dumpmate** will attempt to load and display the file requested, returning to the menu if an error occurs. Once the picture is on display, you may print it by pressing START.

To return to the menu screen, press OPTION. The program will also remind you of this before the picture loads. Make sure your printer is turned on and ready to print before pressing START.

You should use the smoothest paper you can find for the best possible results. Or you can use thermal paper, which yields excellent print quality—although it's hard to find, will eventually discolor, and is subject to damage from fingerprints, scratches and other abrasions. If you do use thermal paper, be sure to remove the ribbon first. The screen print takes about 2½ minutes to complete, and the image remains on the screen until you press OPTION, whereupon you will return to the main menu.

Technical considerations.

Dumpmate works by breaking down the screen display into vertical "stripes," each 7 pixels wide. Unfortunately, 7-pixel fields are a little inconvenient to retrieve from your Atari's memory. In graphics 8, pixels are stored 8 to the byte. So a field of 7 pixels can span 2 contiguous bytes of screen memory, depending on which pixel is our starting point.

To find this starting point, divide the column number by *8*. The result gives us an "offset" that we can add to the pointer in location 88, which marks the start of screen memory. This is the byte which contains the first of our 7 pixels. To find which one is our actual starting point, we use the remainder of the division. For instance, if the cursor is in column 30, *30* divided by *8* is *3*, with a remainder of *6*. Thus, we add *3* to the screen memory pointer to find the byte, and the starting bit is the sixth from the left. Bits are customarily numbered from 0 to 7 starting at the right, so our 7-bit field starts in bit 1 and overlaps into bits 7 through 3 of the next byte of screen memory.

Now that we've found our 7-bit field, what do we do with it? Well, if we want to send it to the Okimate for graphics printing, we have to reposition it, so that it no longer spans 2 bytes. In fact, to print properly, it must range from bit 6 to bit 0.

We can do this easily with machine language shift and rotate instructions. And we'll use BASIC to position the cursor in a loop that starts with the 7-pixel field in the top right portion of the screen. The USR routine then retrieves our 7-pixel-wide stripe of the screen and stores it in a buffer string of 192 characters, each of which represents the 7-pixel field in its corresponding vertical row of the screen. BASIC then prints the string and loops back to reposition the cursor 7 pixels to the left.

The machine language portion of the program occupies the first 149 bytes of page 6. It is completely relocatable and may be loaded into a string, if desired. This routine takes care of all the bit shifting and offset calculations necessary to retrieve our 7-pixel fields, and fills the buffer string. A special case occurs when the cursor is in column 0, (i.e., the left edge of the screen). This is the last stripe of pixels retrieved, and we only need a 5-pixel field, or we will duplicate pixels already printed (because *7* does not divide evenly into *320*.) A flag instructs the routine to do two extra right-shifts of the pixel field to compensate.

If you want to include the print routine in other programs, such as the aforementioned **Solid States**, you need Lines 250-350 to print the display from memory, and Lines 980-1270 to initialize the machine language routine. You may have to renumber these routines to eliminate conflicts (a necessity for use with **Solid States**.)

You will also have to DIMension PRYNT$ and M$ as in Line 190, and initialize M$ to the desired margin setting. The first element of M$ must be CHR$(144). The next 3 elements, M$(2,4), must be the string equivalent of a number between *1* and *288*. For example, *M$(2) = "120"* would produce a 2″ margin, and *M$(2) = "001"* would yield the default setting.

Note that the zeroes in *"001"* are necessary. Alternately, you could just delete all references to M$. In any case, the screen you want to dump should already be on display when you call the print subroutine at Line 250. Also, adjust the error trapping in the print subroutine. To do reverse printing, use the POKEs in Line 1410. This modifies the USR routine (strictly speaking, a programming

no-no), so if you load it into a string, see the REM statement at Line 1420 for the corresponding elements to change.

Well, that should do it. You now have the capacity to do black and white screen dumps with your Okimate printer, as well as color. **Dumpmate** should save you both the time involved in doing color dumps and the expense of buying a new color ribbon every ten printouts or so. I hope this program will enhance the usefulness of your printer and increase your enjoyment of it as much as it has mine.

Arthur F. Horan became hooked on computing three years ago, when he acquired an Atari 800 and began learning to program. He's especially interested in graphics and art, whether generated by computer or the old-fashioned way.

The two-letter checksum code preceding the line numbers here is *not* a part of the BASIC program. For further information, see the *BASIC Editor II*, in issue 47.

Listing 1.
BASIC listing.

```
EA 100 REM ******************************
NC 110 REM *                            *
CM 120 REM *         DUMPMATE           *
JX 130 REM *    by Arthur F. Horan      *
OA 140 REM *    A  Graphics 8 Dump      *
RT 150 REM *    for the Okimate 10      *
ZN 160 REM *         9/23/85            *
NO 170 REM *                            *
EQ 180 REM ******************************
EE 190 GRAPHICS 0:DIM FILE$(15),PRYNT$(19
   2),A$(1),M$(4),DI$(20),DEV$(3),CH$(5),
   MDN$(8)
EQ 200 ? "Please wait while program READS
    DATA":GOSUB 980
XJ 210 CH$="MDNRL":M$="▣001":DN=1:R=0:MDN
   $="01030715"
ES 220 MDN=PEEK(1802):FOR I=1 TO 7 STEP 2
   :IF MDN=VAL(MDN$(I,I+1)) THEN POP :GOT
   O 240
FY 230 NEXT I
NC 240 MDN=(I+1)/2:GOTO 620
FR 250 REM ****PRINT ROUTINE***
FX 260 CLOSE #1:OPEN #1,8,0,"P:"
EB 270 TRAP 350:PRYNT$(1)="♥":PRYNT$(192)
   ="♥":PRYNT$(2)=PRYNT$
ID 280 PRINT #1;CHR$(27);CHR$(66);CHR$(27
   );CHR$(37)
OA 290 FOR X=313 TO 0 STEP -7:POSITION X,
   0
OX 300 D=USR(1536,ADR(PRYNT$))
JL 310 PRINT #1;M$;PRYNT$
LR 320 NEXT X
FG 330 POSITION 0,0:D=USR(1536,ADR(PRYNT$
   )):PRINT #1;M$;PRYNT$
HH 340 CLOSE #1:RETURN
XR 350 PRINT "KERROR - ";PEEK(195):FOR I=
   1 TO 1000:NEXT I:GOTO 620
JO 360 REM ******MAIN MENU******
FT 370 SETCOLOR 2,9,0:SETCOLOR 4,9,0:POKE
    82,0:? "K_____________________________
   ";
ZS 380 ? "        DUMPMATE  by Arthur F. Ho
   ran         ";
CF 390 ? "         a screen dump program
   ";
VT 400 ? "        for the Okimate 10 print
   er            ";
JQ 410 ? "        copyright 1985
               "
AX 420 ? "                 MENU:
          ";
KL 430 ? "  ";:POSITION 38,(PEEK(84)):? "
   ";
KF 440 ? "       M. SET MARGIN         [=
   ]   ";
UR 450 ? "       D. DISK DIRECTORY
   ";
KO 460 ? "       N. DRIVE NUMBER       [
   ]   ";
CF 470 ? "       R. REVERSE ON/OFF     [
   ]   ";
AG 480 ? "       L. LOAD PICTURE FILE
   ";
KX 490 ? "  ";:POSITION 38,(PEEK(84)):? "
   ";
AH 500 POSITION 29,12:? M$(2);:POSITION 3
   0,14:? DN;:POSITION 29,15:IF R=0 THEN
   ? "OFF";:GOTO 520
UE 510 ? "ON ";
RJ 520 POSITION 0,18
UH 530 ? "
   ";
IB 540 ? "
   ":POKE 82,2:POSITION 2,21:RET
   URN
NE 550 REM ****MENU SELECTION****
FF 560 ? "YOUR SELECTION";
XX 570 TRAP 560:INPUT A$:IF A$="" THEN GO
   SUB 370
PC 580 FOR CH=1 TO 5:IF A$=CH$(CH,CH) THE
   N POP :GOTO 610
IR 590 NEXT CH
PN 600 GOTO 560
ZE 610 RETURN
BZ 620 REM *****MAIN LOOP*****
UN 630 GOSUB 360
VL 640 GOSUB 560
BH 650 ON CH GOSUB 1300,890,1370,1400,660
   :GOTO 640
TW 660 POP
VO 670 TRAP 670:AUX=0
YC 680 ? :? "WHAT FILE DO YOU WISH TO LOA
   D":? "Cassette users answer 'C:'"
BU 690 INPUT FILE$:IF FILE$="C:" THEN AUX
   =128:GOTO 740
QI 700 IF FILE$="" THEN 620
KY 710 IF LEN(FILE$)>2 THEN IF (FILE$(1,1
   )="D" AND FILE$(3,3)=":") OR FILE$(1,2
   )="D:" THEN 740
OC 720 DI$=FILE$:FILE$(1,3)="D1:":IF DN<>
   1 THEN FILE$(2,2)=STR$(DN)
CR 730 FILE$(4)=DI$
CL 740 TRAP 350:CLOSE #1:OPEN #1,4,AUX,FI
   LE$
HJ 750 ? :? FILE$;" Will now be loaded":?
    "▸and displayed.":? :? "When you are
   ready to  print,":? "▸Press START."
GG 760 ? "Or to return to the menu":? "▸P
   ress OPTION.":FOR I=1 TO 1500:NEXT I
YC 770 GRAPHICS 24
SL 780 IF R=0 THEN SETCOLOR 2,10,14:SETCO
   LOR 1,0,4:GOTO 800
JC 790 SETCOLOR 2,0,0:SETCOLOR 1,0,12
XA 800 POKE 850,7:POKE 852,PEEK(88):POKE
   853,PEEK(89):POKE 856,0:POKE 857,30
VK 810 D=USR(ADR("h▣♣LV▣")):REM MACHINE L
   ANGUAGE SCREEN LOAD
LI 820 CLOSE #1
```

```
GZ 830 IF PEEK(53279)=3 THEN GRAPHICS 0:G
   OTO 620
CD 840 IF PEEK(53279)<>6 THEN 830
UU 850 GOSUB 250:REM PRINT SUBROUTINE
PY 860 GOTO 830
GL 870 IF PEEK(195)=136 THEN 830
PA 880 GOTO 350
QD 890 REM *****DIRECTORY*****
JZ 900 FILE$="D1:*.*":IF DN<>1 THEN FILE$
   (2,2)=STR$(DN):TRAP 350
CU 910 CLOSE #1:OPEN #1,6,0,FILE$
P5 920 TRAP 960
WA 930 INPUT #1;DI$:PRINT DI$;"|";
OI 940 INPUT #1;DI$:PRINT DI$
QH 950 GOTO 930
GT 960 IF PEEK(195)=136 THEN ? :RETURN
EA 970 ? "ERROR -";PEEK(195):RETURN
ZB 980 REM INITIALIZE M-L PRINT ROUTINE
XC 990 RESTORE 1030
IN 1000 T=0:FOR I=1536 TO 1684:READ A:POK
   E I,A:T=T+A:NEXT I
ZQ 1010 IF T<>21491 THEN ? "↖ERROR IN DA
   TA STATEMENTS...":? "CHECK TYPING":END
AF 1020 RETURN
AX 1030 DATA 216,104,104,133,204,104
QH 1040 DATA 133,203,169,0,133,215
KF 1050 DATA 133,207,133,214,133,216
ZO 1060 DATA 165,86,208,6,165,85
AQ 1070 DATA 208,2,230,216,160,3
MQ 1080 DATA 70,86,102,85,102,215
QR 1090 DATA 136,208,247,160,5,70
SH 1100 DATA 215,136,208,251,165,215
LG 1110 DATA 208,8,169,1,133,207
XC 1120 DATA 133,214,208,6,165,215
ZJ 1130 DATA 133,207,198,207,165,88
TO 1140 DATA 24,101,85,133,212,165
HI 1150 DATA 89,105,0,133,213,160
JE 1160 DATA 0,177,212,133,205,200
PQ 1170 DATA 177,212,133,206,165,214
NX 1180 DATA 240,7,70,205,165,205
TX 1190 DATA 24,144,15,164,207,240
JC 1200 DATA 7,6,206,38,205,136
IY 1210 DATA 208,249,165,205,41,127
PH 1220 DATA 234,234,164,84,166,216
IG 1230 DATA 240,2,74,74,145,203
KP 1240 DATA 169,40,24,101,212,133
JT 1250 DATA 212,169,0,101,213,133
IF 1260 DATA 213,200,132,84,192,192
ER 1270 DATA 208,187,198,84,96
C5 1280 REM * 149 BYTES
WE 1300 REM *****SET MARGINS*****
OY 1310 ? "MARGIN IS SET IN SIXTIETHS OF
   AN INCH.CHOOSE ANY NUMBER FROM 1 TO 28
   8.":TRAP 1310:M$="■001"
RW 1320 INPUT M:M=INT(M):IF M<1 OR M>288
   THEN 1320
LW 1330 IF M<10 THEN M$(4)=STR$(M):RETURN
UT 1340 IF M<100 THEN M$(3)=STR$(M):RETUR
   N
YW 1350 M$(2)=STR$(M):RETURN
5A 1360 REM *****CHANGE DRIVE NUMBER*****
MM 1370 ? "DRIVE NUMBER IS NOW ";DN:? "CH
   ANGE TO ";
5S 1380 TRAP 1370:INPUT NDN:IF NDN<1 OR N
   DN>MDN THEN 1370
MW 1390 DN=NDN:RETURN
BD 1400 IF R=0 THEN R=1:? "REVERSE PRINTI
   NG IS ON":POKE 1650,73:POKE 1651,127:R
   ETURN
JH 1410 R=0:? "REVERSE PRINTING IS OFF":P
   OKE 1650,234:POKE 1651,234:RETURN
K5 1420 REM Bytes at 1650 and 1651 (115th
    and 116th bytes) are NOPs for reverse
    printing.
```

Listing 2.
Assembly listing.

```
      ORG 1536
; ***************************
; *   DUMPMATE M-L UTILITY  *
; *  used to process screen *
; *   memory for printing   *
; *   with the Okimate 10   *
; * printer and the Dumpmate*
; *      BASIC program      *
; *   revision of 9/23/85   *
; *   by Arthur F. Horan    *
; ***************************
;
;
;Equates:
ROWCRS   = 84; Y-coordinate
COLCRS   = 85; x-coordinate
PRINT    = 203; pointer to PRINT$
PBL      = 205; stores processed
               ; screen data-lo byte
PBH      = 206; scrn data - hi byte
SAVMSC   = 88; start of screen mem
SHIFT    = 207; shift factor
LAST     = 216; flag for column 0
SCREENAD = 212;pointer to scrn byte
NOLFT    = 214;flag for sh.
               ; direction
OFFSET   = 215; for current line
               ; dump
CIOV     = 58454; vector to CIO
;Program starts here
     CLD
     PLA      ;discard # arguments
     PLA      ;pull hi-byte of
              ; PRYNT$
     STA PRINT+1 ;and save
     PLA      ;now get lo-byte
     STA PRINT ;save it too
;
;Initialize variables
     LDA #0
     STA OFFSET
     STA SHIFT
     STA NOLFT
     STA LAST
;
;Check if column 0
     LDA COLCRS+1
     BNE GETOFF
     LDA COLCRS
     BNE GETOFF
     INC LAST ;yes, set flag
;
;Loop to get offset
GETOFF LDY #3
DIV8 LSR COLCRS+1; divide x-pos
     ROR COLCRS ;by 8 for offset
                ; into screen
     ROR OFFSET ;memory and save
     DEY      ;remainder as offset
              ; into lo-byte
     BNE DIV8 ;of 7-bit pixel array
;
;Now right-justify remainder
     LDY #5
JUST LSR OFFSET
     DEY
     BNE JUST
;
;Initialize shift factor according
;to bit-offset
;of cursor position in screen
INSH LDA OFFSET
     BNE OF1
     LDA #1
```

```
      STA SHIFT
      STA NOLFT
      BNE PROCESS
OF1   LDA OFFSET
      STA SHIFT
      DEC SHIFT
;
; Now process screen bytes
;
PROCESS LDA SAVMSC ;set up pointer
      CLC
      ADC COLCRS
      STA SCREENAD
      LDA SAVMSC+1
      ADC #0
      STA SCREENAD+1
;
;Loop through a vertical "STRIPE"
; of screen & process it for
; printing
GBYTE LDY #0
      LDA (SCREENAD),Y
      STA PBL ;get pic-byte lo
      INY;
      LDA (SCREENAD),Y
      STA PBH ;& pic-byte hi
      LDA NOLFT ;shift right?
      BEQ SH2 ;no, so skip ahead
      LSR PBL ;shift right one bit
      LDA PBL
      CLC     ;force branch
      BCC FILBUF
;
SH2   LDY SHIFT ;shift 7-bit field
                ; left according
      BEQ NOSH ;to calculated factor
;
DOSHL ASL PBH ;shift hi-byte
      ROL PBL  ;and rotate lo-byte
      DEY
      BNE DOSHL
;
NOSH LDA PBL
      AND #127 ;mask out bit 7
;
;Fill buf strng with processed byte
FILBUF NOP      ;padding to allow
                ; later modification
      NOP       ;for reverse printing
      LDY ROWCRS
      LDX LAST
      BEQ FILL  ;handle last stripe?
      LSR A
      LSR A    ;yes, so shift
FILL  STA (PRINT),Y ;fill PRINT$
      LDA #40 ;set pointer to next
      CLC
      ADC SCREENAD ;screen row
      STA SCREENAD
      LDA #0
      ADC SCREENAD+1
      STA SCREENAD+1
      INY
      STY ROWCRS
      CPY #192 ;done?
      BNE GBYTE ;no, go back.
      DEC ROWCRS
      RTS ;That's it!
```

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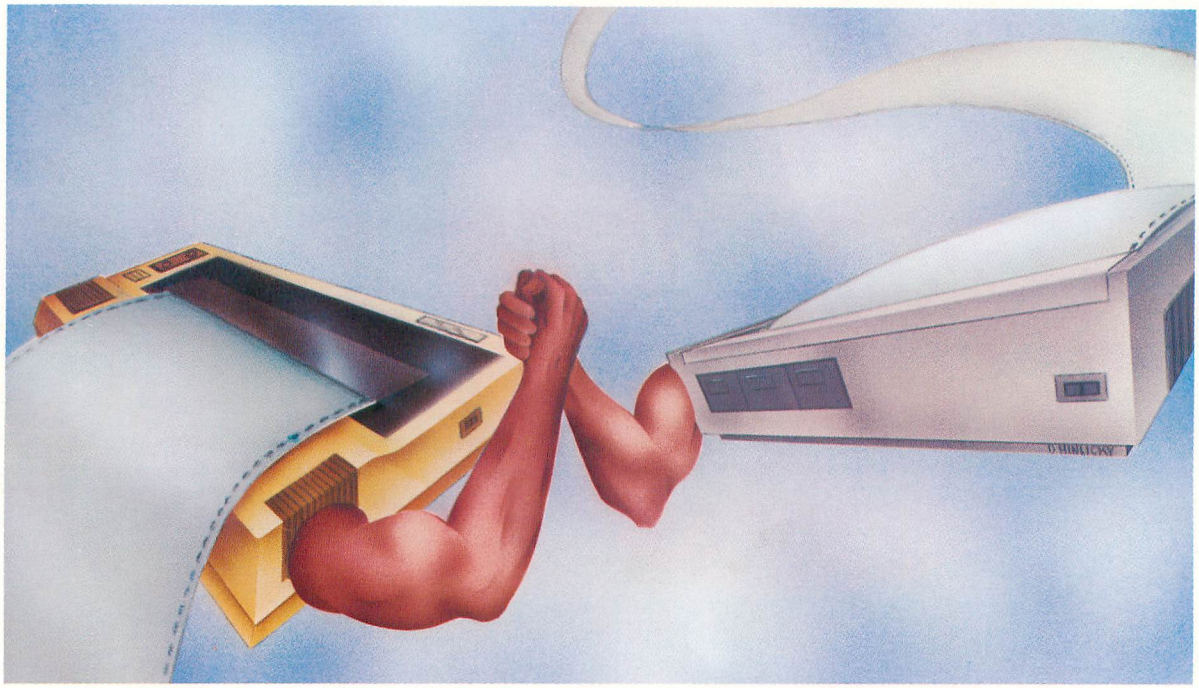

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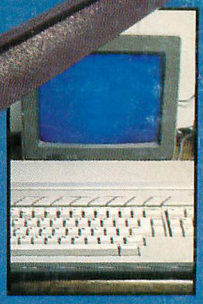

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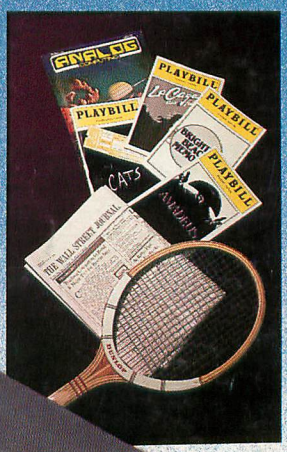

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