NO. 42
MAY 1986

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THE #1 MAGAZINE FOR ATARI® COMPUTER OWNERS™

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THIS ISSUE:

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Printing Utility
M/L Editor

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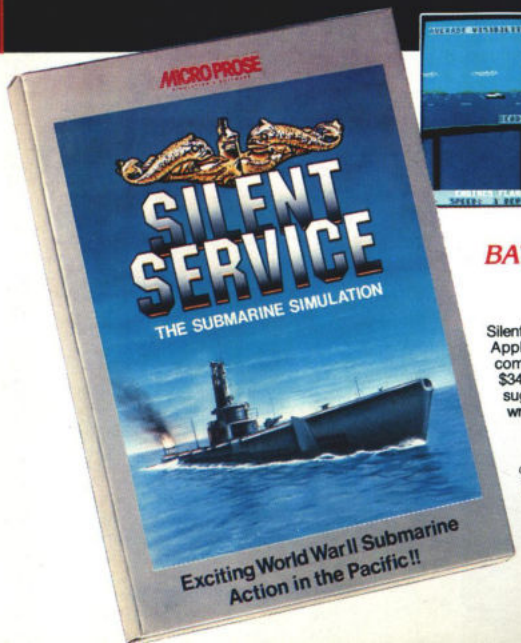
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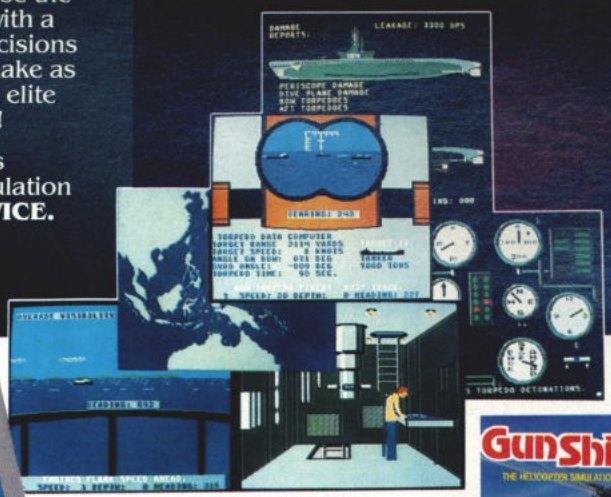
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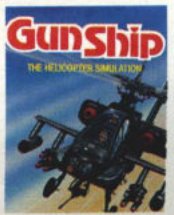
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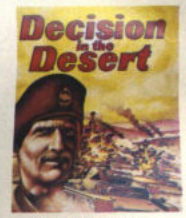
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NO. 42 MAY 1986

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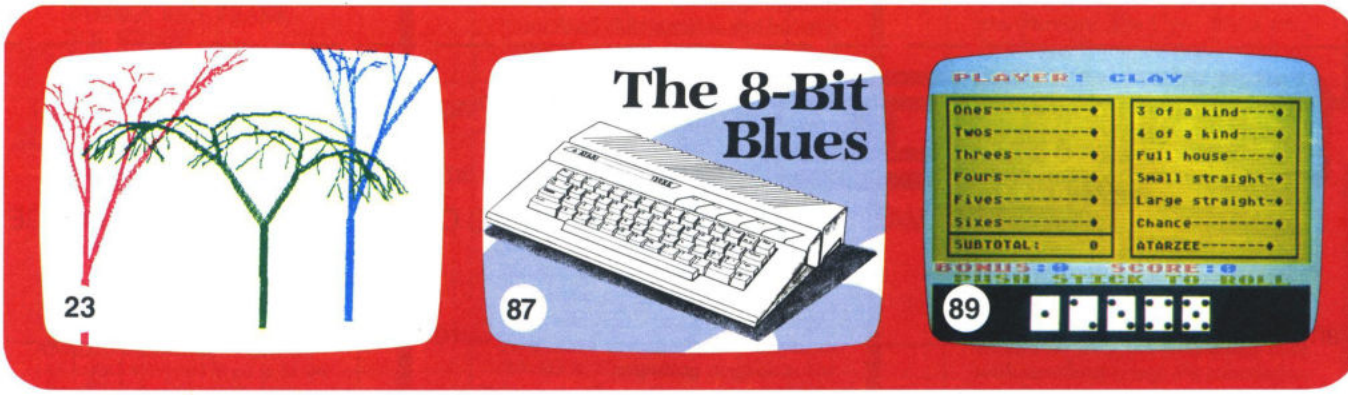
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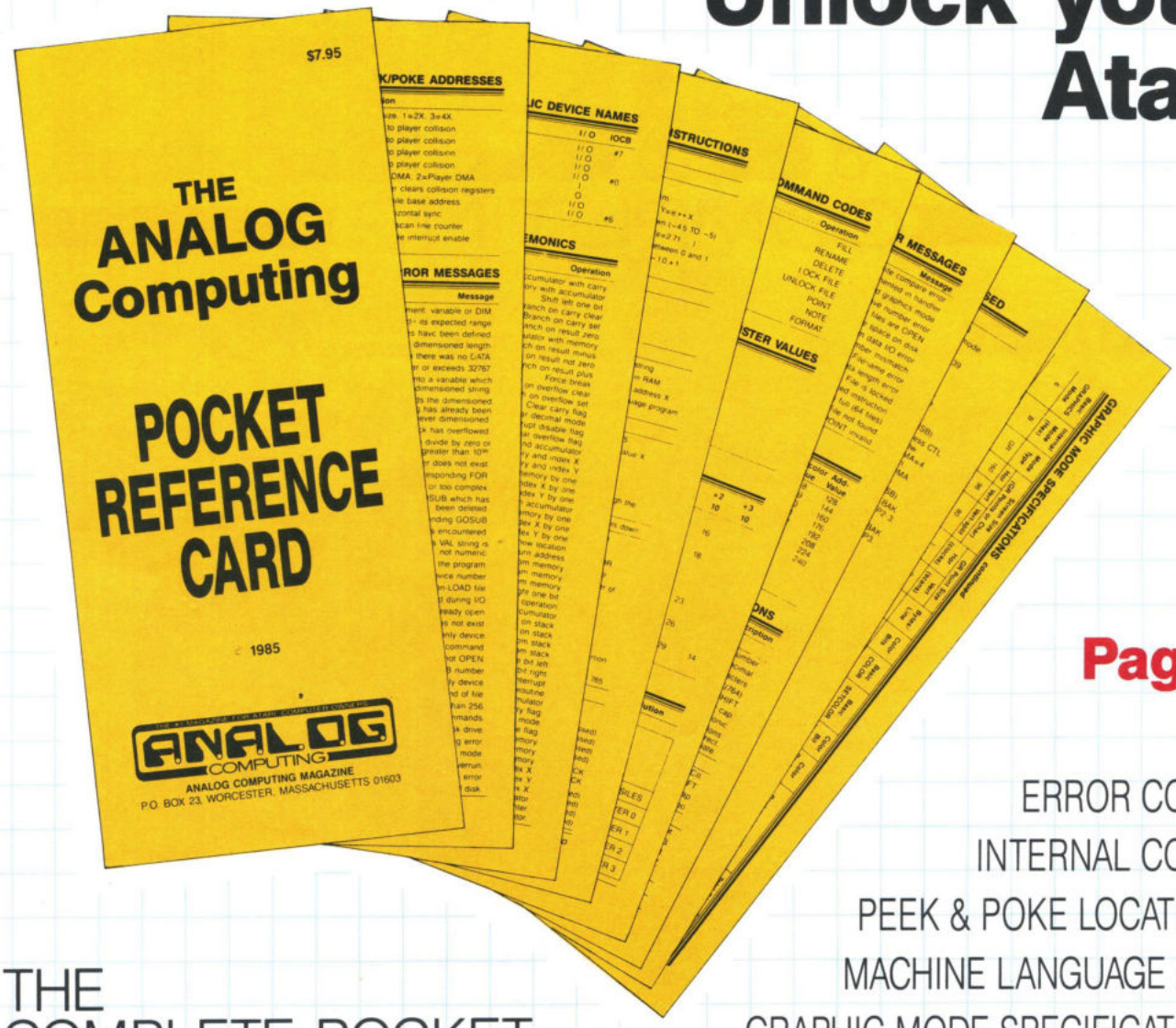
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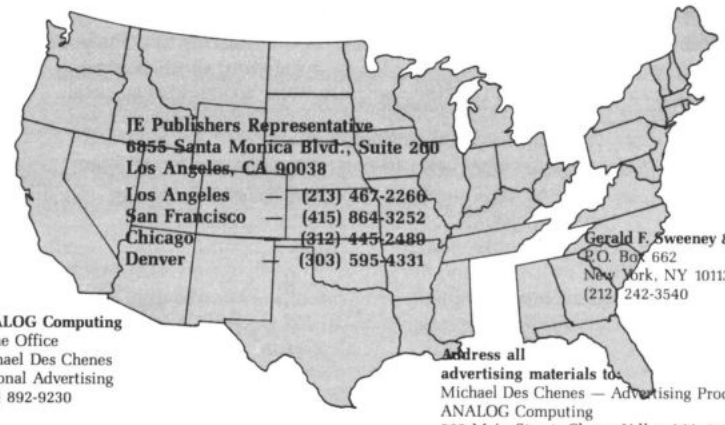
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Due, however, to many requests from Atari club libraries and bulletin board systems, our new policy allows club libraries or individually-run BBSs to make certain programs from **ANALOG Computing** available during the month printed on that issue's cover. For example, software from the July issue can be made available July 1.

This does not apply to programs which specifically state that they are *not* public domain and, thus, are not for public distribution.

In addition, any programs used must state that they are taken from **ANALOG Computing** magazine. For further information, contact **ANALOG Computing** at (617) 892-3488.

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AUTHORS

When submitting articles and programs, both program listings and text should be provided in printed *and* magnetic form, if possible. Typed or printed copy of text is mandatory and should be in upper and lower case with double spacing. If a submission is to be returned, please send a self-addressed, stamped envelope.

EDITORIAL

They come in all shapes and sizes; by first-class mail and postage due; from California, Germany and Australia; from doctors and teens, experts and novices.

Regardless of form or origin, all the submissions we receive have one common factor—each carries a writer's desire to see his or her words in the pages of **ANALOG Computing**.

That may sound corny, but if you've consigned the product of several weeks' labor to the U.S. mail, only to wait what seems (to your suspense-stricken mind) enough time for the rise and fall of the Roman empire—for a response you may not even like—you know what I mean.

And don't get the idea that this anticipation is one-sided. Without our contributors, **ANALOG Computing** would be a nonentity.

So how can you increase your chances of publication? How can you avoid wasting postage on a submission that doesn't even make the starting gate? Read on.

Rule #1: Common, "old hat" ideas should be avoided like a rabid beast. Not a week goes by that we don't receive a character set editor, labeler, math quiz, disk editor, disk copier, doodle program, player/missile mover, program loader, disassembler, or investment analyzer. The list goes on; you get the point. Unless you convince us *your* character set editor is absolutely essential to the well-being of the Atari community and mankind's continued survival, don't bother.

Rule #2: Chances of publication are in direct proportion to the size of the article's potential audience.

Not that we're not interested in somewhat esoteric submissions. We believe in pleasing minorities, too. But articles with the general reader in mind have a distinct advantage.

Rule #3: Size of a submission is a definite consideration—the shorter, the better. This is especially true of articles not under Rule #2.

Take the space to write a decent article—not a word more. Knowing what to cut and what to keep is essential. Take it from someone frequently accused of verbosity; it's tough.

Rule #4: Graphics, graphics, graphics. I can't stress this enough. Nicely designed screens and details make the difference between a contract and a rejection.

Ataris are powerful machines, and we insist that contributors take full advantage of that power. Of course, this rule should be tempered with common sense. If your program's a simple utility, we don't expect menus dancing to Beethoven's Fifth while juggling aliens. That would be a violation of Rule #3. However, if you're writing a game...

Rule #5: This is a combination of minor rules: double-spaced manuscripts, inclusion of program and text disks, and, if you wish materials returned, self-addressed, stamped envelopes.

These are the common courtesies one expects from professionals. One of my pet peeves: disks with no DOS. Arrrgh! Work should be neatly prepared. Though we've never rejected a submission because the manuscript was a mess, tramping through a jungle *doesn't* put an editor in the best frame of mind.

Finally, the most important rule is: do the best job possible. There's no scale by which to judge "best." It's the one criteria you must evaluate for yourself.

To be more specific about our wants: ST material is number one on the list. Last month, we premiered our new **ST-Log**, and all but one article was written by our staff members. The ST market is new and wide open. Most any well written article is sure to find a home.

Second in our hierarchy of needs (now I sound like Maslow) is 100% machine language programs. Show us an arcade quality game, and we'll show you a contract. Honest.

Finally, something we're insatiable for—product reviews. When you see something new, hop on it. If you write well and are first through the door, we'll have you signing on the dotted line.

If your submission doesn't fit one of these categories, don't despair. These are the things we need most, There's room for imaginative, carefully crafted projects. Would I lie to you?

In coming months, **ANALOG Computing** readers will see the finest work by those hardworking contributors who have successfully juggled the rules. The June issue will be dedicated to computers in the home.

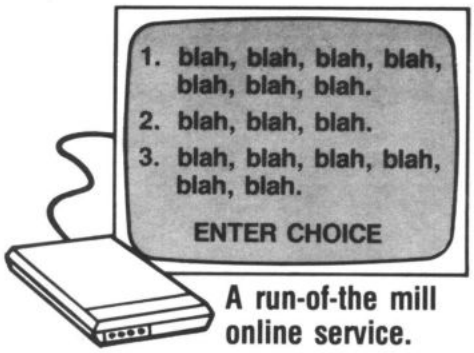
Looking further ahead, we've planned a hardware issue, a language issue and a special 8-bit issue. The latter will feature the latest for the fine machines that started it all. More proof that **ANALOG Computing**'s concerned with all Atari users, not just those who've moved to newer things.

Finally, I'd like to thank everyone for the support I've received. Your kind comments have been welcomed. Forced to truthfulness, I'd have to admit the last six months have been a blast. **ANALOG Computing** is one of the wonders of the world, and I'm still stunned to be a part of it. Hey, thanks.

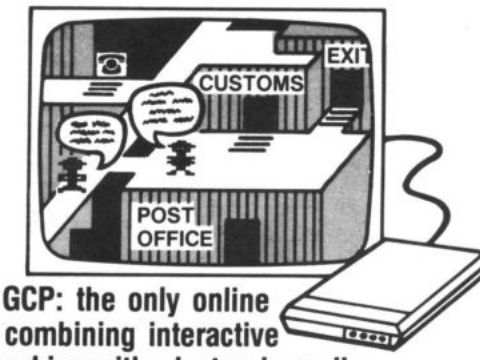


Clayton Walnum
Technical/Submissions Editor
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GCP: the only online service combining interactive graphics with electronic mail, downloads, AND games!

What is an online service?

An online service consists of a large, multiuser computer which your computer can access through the telephone lines. Since many people can access it at one time, you can interact and exchange information with other computer owners.

How is GCP different from other online services?

All other online services are out-growths of business information services. GCP was designed from the ground up to be a service for home computer owners. This means that GCP is easy to learn and fun to use. You can do everything you want with the joystick and function keys on your computer.

In order to provide all these capabilities, we have implemented the entire system using full color graphics. GCP is set up as a City, with buildings for the Post Office, GCP offices, Games and other services. You, and the other customers, are figures which you move around in the City with your joystick.

You mean the City is shown on my TV screen?

Yes, indeed. Not only the City, but the inside of the buildings and the games are shown on your screen in full color graphics. Additionally, the other customers are shown on your screen as they move around the City and buildings.

Isn't it slow downloading the graphics?

No, because we do not download the graphics. All the pictures of the City, buildings and games are supplied on disk. When you go from one building to another, the graphics are accessed at disk drive speeds.

Do I need special software?

Yes, very special. But don't worry, we provide it with your signup.

Can I download public domain programs?

Yes, GCP has a public domain archive in its Post Office with about a Megabyte of Atari programs you can download.

What games do you have?

At the moment, we have BioWar, CyberTank and CyberShip. Lords of Space is under development and may be done by the time you read this. All the games are played online against other customers, so you are matching wits with humans from all over the country.

BioWar is a multi-player adaptation of Conway's game of Life. Each player has a cell colony which he tries to expand, often at the expense of the other players, while contending with the problems of under- and over-population.

CyberTank and CyberShip are tactical design and combat games set on the CyberWorld, an artificial battleground for cybernetic machines. You design your own tank or ship and battle it out with up to 15 other players on a scrolling map.

Do the games use graphics also?

Extensively. For example, in CyberTank, when you design your tank, the hull is shown on the screen, as are all the equipment choices, in full color graphics. You select and place the items by using your joystick.

In the combat phase, your screen shows the status of your tank, the 1 mile area around your tank (only a part of the larger battlefield), and any enemy tanks inside that area.

What equipment do I need?

GCP supports any member of the 8 bit Atari line with 48K of memory. You will also need a disk drive and a modem. We support all the available modems for the Atari.

How much does it cost?

The signup kit includes the software and documentation you need, plus 5 free hours at standard rates. This kit costs $30. After the free hours are used up, the standard rates are $6 per hour (weekday evenings after 6pm local time and all day Saturday and Sunday) for either 300 or 1200 baud access. Daytime hours during the week are $15/hour.

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READER COMMENT

Get real!

First let me state right off: I'm both a loyal Atari computer fan and a loyal **ANALOG Computing** fan. Now, excuse me while I grumble.

To the unknown author of the **Reader Comment** letter entitled "Illegal software distributors" in issue 39, February 1986: let me say that, if you are reading this, then you have just met someone who does *not* own any pirated (illegal) software. Now to the point. I agree with you; piracy is wrong. However, ranting and raving will not solve anything.

Yes, you suggest we write our congressmen. But what should we advocate? As an audio engineer, the problem of piracy has been a constant headache to my industry. One thing, though, must be realized. If people have cassette recorders, they will dub records or copy videotapes. There are too many of them in people's homes to prevent this. I certainly hope you—or anyone—do not advocate the legal storming of people's homes in order to remove an individual's personal cassette deck or home computer.

Congress tried to pass additional taxes on blank tapes and home recording equipment, in order to lessen the burden of loss incurred by record companies. That plan did not work. The subsequent loss in blank tape and home equipment sales would have killed some of the companies that produce these items.

Don't get me wrong, I'm not suggesting we sit back and let piracy happen, but we must have realistic solutions. And, in that vein, I will offer this one.

In most cases, it is not possible to copy a copy-protected disk without some form of hardware enhancement to a computer system. Since laws exist making piracy illegal (yet piracy continues), let's advocate laws making it illegal to produce or sell the devices that allow people to make copies of copy-protected disks. This will not stop piracy, but it most certainly will slow it down.

Complaint number two is in regard to the editorial in the same issue. As I said, I'm a loyal Atari computer fan. (I have a 400, 800XL, 130XE, two 1050s, a 1030, etc.) However, this does not mean I think everything Atari does is correct.

When we are told, repeatedly, that it is up to us, the Atari users, to "advertise" the wonders of our machines, I get upset. Atari should be thankful if my enthusiasm for my toys incites someone to buy an Atari. But I have no intention of seeking out businesses, or computer shoppers, or comparative advertisers, and informing them about Atari. That is not my job.

I hate to say it, but if Atari wishes to be recognized by people other than loyal Atari users, in this high-tech, PR-saturated world, they will have to advertise! That means TV commercials, radio spots and colorful ads in magazines other than the Atari-oriented ones.

I am sorry, but Atari does not pay my bills. Atari has created some great machines, but if they want people to know that, *they* will have to tell them.

Sincerely,
Keith Mosher
Columbia, SC

*Actually, your enthusiasm is exactly what our editorial was asking for. No one at **ANALOG Computing** expects users to actually seek out ways to "sell" Atari, but we think you should know how powerful your individual and collective word of mouth advertising can be. When you mention Atari computers in a positive way, you've influenced someone. We just wanted to remind our readers that they can and do make a difference, whether it's against piracy or for Atari. —Ed.*

Keep those programs coming.

I have been a regular reader of **ANALOG Computing** for over two years. Naturally, I have preferred the contents of certain issues more than others. However, I feel that the February issue, 39, consistently exhibited an overall level of excellence that is unsurpassed by an Atari-specific magazine in recent memory.

I applaud the recently introduced feature **The End User**, as Mr. Leyenberger continually displays an intelligent approach to his subject matter, that is both entertaining and informative. Mr. Clayton Walnum's articles were a delight, as his unconventional humor (for a "serious" article/tutorial) served to make his work refreshing as well as thought-provoking.

But mostly, I was pleased to see that several utility programs were included. I feel that, as the novelty of computer graphics and arcade games begins to wear off, most serious users prefer to see functional programs, tutorials and recent market developments (especially new product reviews) in their publications.

I would also like to encourage your readers to continue to send in their programs, as some of the most useful programs I have were found as type-in software from your magazine. Specifically, **XL-DOS** (issue 24) is worth its weight in gold. Has anyone modified this program to work with DOS 2.5?

My congratulations to Angelo Giambra for **Home-made Translator** (issue

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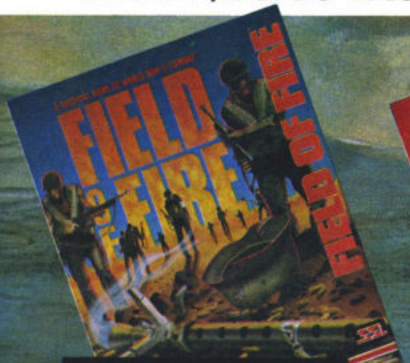
Two of the six scenarios: An ambush by Viet Cong forces near Suoi Cat on December 2, 1966...



U.S./ARVN units attempt to retake Hue during the Tet Offensive, February 1968.



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32). Angelo, please don't let unwarranted criticisms from the unappreciative dissuade you from sharing more of your work with **ANALOG**'s readers. If you have other programs half as good as **Home-made Translator**, many of us less skilled, would-be programmers would really like to see them.

Finally, to all contributors and regular feature writers at **ANALOG Computing**, I say, "Keep up the good work!"

Robert P. Komer
St. Louis, Missouri

C language — welcome.

Thanks; I am glad you decided to start on the **C-manship** series. I personally think that this will become the dominant language for the 520ST.

Could you use **C-manship** to start explaining such basic things as: opening windows (all kinds), using the mouse, making comparisons on mouse v.s. window locations, changing colors, saving the color palette, drop-down menus and their entries, VDI, AES and GEM—just to name a few? I mean, let's start at the beginning, the basics of the machine.

One thing that bothers me: why cut down released languages, such as **Hippo-C**? Isn't there quite enough bad press out there about Atari? Yeah, I agree it lacks a lot of things that would be nice, but it will do quite enough to begin with.

I guess you figured it out; I bought **Hippo-C** and I have not bought the development package. I did this because it was what I could afford at the time.

I can't help but wonder how many other beginners did the same thing. My main point here is that I don't think the negative press on any Atari product is helpful and I think—for the beginner—that **Hippo-C** is an okay choice.

Thanks for **The ANALOG Computing guide to ST SOFTWARE**. I think this is a great addition to your magazine—keep up the good work.

Billy Graham
Bedford, TX

*Regarding **Hippo-C**, the main reason we chose not to recommend it for **C-manship** was that it didn't support floating point numbers. There were also library routines, such as scanf(), that were not handled by the compiler. We understand, though, that newer versions of the program have an expanded function library.*

*As for the material covered in **C-manship**, the first step was to give an introduction to the language. In future installments, the handling of windows and other GEM functions will be addressed.*
—Ed.

Home computers?

Shame on you for the leading caption on the cover of your February 1986 edition of **ANALOG Computing**, "Commodore vs. Atari—Whose machine is the real challenger in home computing?"

Let's not cast the ST in the image of a home computer (translated "game machine"). I know you would agree that the ST is a computer which should satisfy the needs of business, education and the consumer market. I believe that using the term "personal computer" would have a broader connatation and not have the negative image that "home computer" may carry.

Keep up the good work. Thanks for the new series on C by Clayton Walnum. Please keep us informed of the latest events with Atari. I'm especially interested in the CD-ROM, hard disk, laser printer, TOS-ROM, memory expansions and, as always, software.

Sincerely,
Brian Wilson
Austin, TX

Visible support.

I always enjoy Arthur Leyenberger's articles, but I disagree with his evaluation of support from the new Atari Corp. stated in the February 1986 **End User** column.

Could Atari provide better support? Of course they could, and Mr. Leyenberger's suggestions for areas that could use work are fine. On the other hand, the support provided is far above average, even though it may fall short of excellent.

Consider the number of products Atari introduced in 1985, both hardware and software, both 8- and 16-bit based. Imagine the amount of coordination required to get any new product to market, much less meet a commitment date. Can you think of a single one of these products that did not deliver "power without the price"? This is quite a contrast to other high-technology companies, especially the old Atari.

Atari makes the 520ST Developer's Kit available to serious programmer users, as well as to companies that will develop the software which will ultimately sell machines. Atari BASIC for the 520ST is being distributed, free, to ST owners who purchased their machines before the language was available. I am writing this letter using a word processor that Atari gave me, free, through my user group. That's pretty good support!

Frank de Lathouder
Birmingham, AL

U.S. pen pal wanted.

I would like an American pen pal who owns an Atari computer and is *quite* knowledgeable with games and programming. Anywhere in the U.S. (or even another country) is fine, perhaps to exchange ideas, information, etc.

Here are some of my interests: animals, computers and games (of any kind) and science fiction. I am 14 years old.

I am looking forward to hearing from you.

Jonathan Browning
18 Wilkinson Close
Wylde Green, Sutton Coldfield
Birmingham, West Midlands
England, B733QG

Blue Chip revisited.

In the January 1986 **ANALOG Computing** magazine (issue 39), in the **Reader Comment** column, Mr. Marv Larson made positive comments on the Blue Chip M 120/10 Printer.

I have asked several people and computer stores, and none had information about the printer or its dealer.

My last hope is you. I request that you send me the dealer's name and address or phone number.

Sincerely,
John Ruiz
Santa Maria, CA

Blue Chip Electronics markets the M120/10 Printer by Computer Gesellschaft Konstanz (CGK) of West Germany, which is the "General Electric of Europe." The U.S. distributor for CGK is: Blue Chip, Two West Alameda, Tempe, AZ 85282, (602) 829-7217. — Ed.

Micro-Mail mod.

Here is a modification to **Micro-Mail** (issue 40) by Clayton Walnum. It may interest some of your Canadian readers.

Type in the accompanying listing, including the REM statements at Lines 730 and 740, LIST it to disk or cassette, LOAD the original **Micro-Mail** program, then ENTER the listing. After it is en-

(continued on page 112)

NEW PRODUCTS

RED RAT SOFTWARE

Technicolor Dream enables any user to create on-screen pictures containing up to 256 colors simultaneously. Several utilities, in-



cluded with the program allow the user to store pictures to disk or print out to an Epson (or compatible) printer.

For additional information and prices, contact your local dealer or write to Red Rat Software Limited, 11 Fennel Street, Manchester, England M4 3DU.

CIRCLE #177 ON READER SERVICE CARD

INFOMANIA

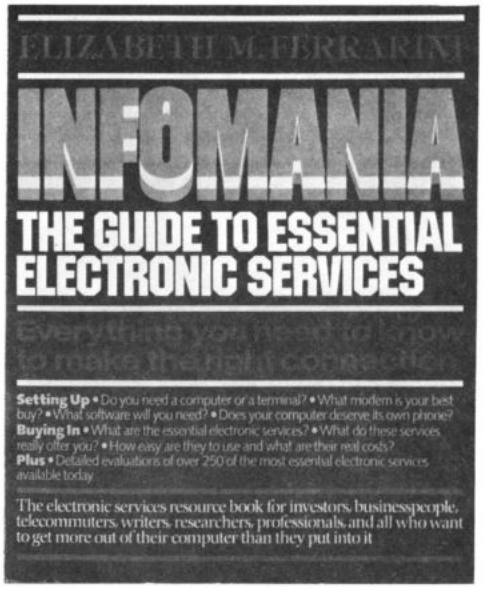
This guide to electronic services provides the computer user—experienced pro and novice alike—with all the right connections.

Chapters cover various services available to computer operators, including: news, financial, data, educational and shopping.

Infomania also has plenty of information that will help you tackle life's many chores—things like examining travel resources, job hunting, or choosing careers. BBSs, electronic mail, people, and more are covered, too. The book's 314 pages should prove to be a useful resource for *all* Atari owners, 8-bit and 16-bit alike.

For more information on ***Infomania: The Guide to Essential Electronic Services***, you should contact Houghton-Mifflin Co., 2 Park Street, Boston, MA 02108. Give the ISBN number — ISBN 0-395-36297-0.

CIRCLE #178 ON READER SERVICE CARD



THE GRAPHICS MAGICIAN PAINTER

This lets you create colorful graphics on-screen, selecting from hundreds of colors and patterns like circles, boxes, lines, fills and brushes. **Graphics Magician** has a unique storage system to allow storage of hundreds of pictures on a single disk.

The cost is $39.95, from Polarware/Penguin Software, 2600 Keslinger Rd., P.O. Box 311, Geneva, IL 60134 — (312) 232-1984.

For additional XL/XE products from Polarware, see **ST News**, page 55ST.

CIRCLE #172 ON READER SERVICE CARD

ACCESS SOFTWARE

Raid Over Moscow puts high-resolution graphics, scrolling playfields and sound effects to use, producing a realistic search-and-destroy simulation.

The game has the Soviets launching an atomic strike against major U.S. and Canadian cities. You must deploy stealth bombers from an orbiting space station, to destroy the warheads before they reach their targets.

This disk-based game works with either joystick or keyboard. For all 8-bit formats; $34.95. Access Software Inc., #A 2561 South 1560 West, Woods Cross, UT 84087.

CIRCLE #181 ON READER SERVICE CARD

RACING DESTRUCTION SET

This new game from Electronic Arts pits one player against the computer or another player. The split screen scrolls as you screaam around your choice of over fifty tracks stored on disk.

Spinouts, collisions, oil slicks and even land mines add to the challenge. You can select between Indy cars, Baja racers, motorcycles, Can-Am cars, and more.



An editor allows you to modify the tracks; add ice, dirt curves, or jumps; or build your own course.

Priced at $32.95, from Electronic Arts, 2755 Campus Drive, San Mateo, CA 94403.

CIRCLE #182 ON READER SERVICE CARD

OTHER NEWS

Reeve Software has announced the **Evader Construction Set**, a 32-level game, available with or without its construction set.

In the **Evader**, you land your shuttle on various alien landscrapes. With its construction set, the package retails for $19.95. Game Pack #1 includes: **Battle Tank**, **Bomber** and **Space Hunt** for $16.95.

Reeve Software also has the **Business Manager**, to give you invoicing, shipping and tax features for $49.95; plus **Utile Utilities**, which contains many utilities for $16.95.

For additional information, write to Reeve Software at 29W150 Old Farm Lane, Warrenville, IL 60555, or call (312) 393-2317.

CIRCLE #179 ON READER SERVICE CARD

■ ■ ■

Screens is a machine language utility allowing for the easy creation of windows on the Atari 8-bits.

By creating a device, *W:*, a window of any size and color can be opened—at any time. Other features are also included in the 32K+ program.

Priced at $19.95 from the Soft Cellar, P.O. Box 14393, Rochester, NY 14616-0393.

CIRCLE #180 ON READER SERVICE CARD

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CIRCLE #105 ON READER SERVICE CARD

SPELLBREAKER



by Dave Lebling
INFOCOM, INC.
125 Cambridge Park Drive
Cambridge, MA 02140
48K Disk $44.95
Also available for 520ST

by Greg Knauss

The people are mad. Magic is failing all across the land, and a meeting at Borphee has been called.

One by one, the head of each Service Guild stands and gives a personal view of how this or that spell has gone haywire. People have been hurt. Time has been lost. And the people are mad.

You attend the meeting as Guildmaster of the Circle of Enchanters at Acardii, a position you inherited from your mentor Belboz, and listen patiently to the stories—stories that slowly become charges. . .

The word traitors *pops out of nowhere, and, just as you think the meeting is going as badly as it can, everybody mysteriously turns into. . .well, they turn into frogs. Frogs, newts and salamanders—the entire amphibian phylum seems to be represented.*

Your keen mind quickly decides that something is wrong. Through the rainbow of hopping, slithering and croaking colors, you notice a black-clothed figure slip out of the room and into the street. You give chase.

The figure turns. Though you strain your eyes in the bright sunlight, its face lies hidden in deep shadow. It jumps, backflips and, in a bright orange explosion, is gone. . .

So begins **Spellbreaker**, the last chapter in the **Enchanter** series of Infocom's all-text interactive fiction.

Once again, you take the guise of the rapidly maturing young enchanter, who has become famous throughout the land for defeating both Krill and Jeearr. Once again, you must venture into the labyrinthian passages running beneath the surface world that you know best. Once again, the future of Frobozz is in your hands. Who is the mysterious, black-cloaked sorcerer? What is becoming of the magic? These are dangerous questions that only one person can answer, only a **Spellbreaker**.

Infocom, as tradition dictates, ends each of their series with the hardest, most fiendish puzzles lumped into one game. This is the case with **Spellbreaker**. I've spent many an hour torturing my mind in various ways, trying to get a new idea to pop out.

In fact, Infocom held a tournament between three groups of college students, to see who could solve the game first—without dying once. The first and only group to finish took twenty (count 'em, twenty) hours! **Spellbreaker** is by far the nastiest, most complex game from the Cambridge, Massachusetts company so far. People who breezed through the Babel Fish situation, rejoice.

One of the problems of the game, not necessarily a puzzle *per se*, has to do with the game's "inventory" feature. There are several objects in the game identified only as "a featureless white cube." How does the game know *which* featureless white cube you mean when you type *Throw cube*?

It doesn't. It assumes that you mean the first cube in your inventory, whether this is the case or not. It is, to say the least, very frustrating, especially for beginning players (but then, beginning players have no business messing with an Expert level game.) Though there is a device that allows you to determine which cube is which, and using the wrong one is never deadly, novices are forewarned.

The prose of the game is excellent. Descriptions are detailed, but not overly lengthy. Continuing tradition, there are several very funny moments for folks who sidetrack from the main plot.

Obviously, you're the major character, but you're also the *only* character who's more than one-dimensional. Though **Spellbreaker** is chock full of objects with personal pronouns for names ("people"), they are but frames—no substance aside from a handful of random, one-sentence responses. This is a magic- and object-manipulation game with few verbal interactions, following in the footsteps of **Zork**, rather than **Deadline**.

Magic is bountiful in **Spellbreaker**, and as a Guild Master you have access

to more powerful spells than in either **Enchanter** or **Sorcerer**. This magic, however, doesn't always work. Due to the previously mentioned mysterious force, many a time your spell will misfire, causing distant thunder, temporary blindness, green balls of light and, to the gamer, inconvenience.

Though the spells always work in situations where your life is at stake (this is a *selective* mysterious force, no doubt), it can be a royal pain typing *Learn malyon*. *Malyon angry Ogre* four times before it works.

The game's cosmetics have changed considerably since **Zork**. First, the screen is totally redesigned. With **Wishbringer**, Infocom made several cosmetic changes to their games. The changes remain in **Spellbreaker**.

The familiar white block has been replaced with a flashing black underline of a cursor. The location line at the top of the screen has become permanent. It no longer scrolls off with the text, only to be redrawn. The keyboard handler has been redone. This remedies the break problem of earlier games (when BREAK was pressed instead of BACKSPACE, the game would crash), but has some new problems of its own.

The CAPS/LOWER key is totally ignored. When I play adventures, I like to upper-case my commands, to separate them from the text of the game. The new handler prohibits this.

You also cannot use the cursor keys. I am not the world's most accurate typist. When I mistyped a word, I used to simply "cursor up" and change the old line. No more—alack and alas.

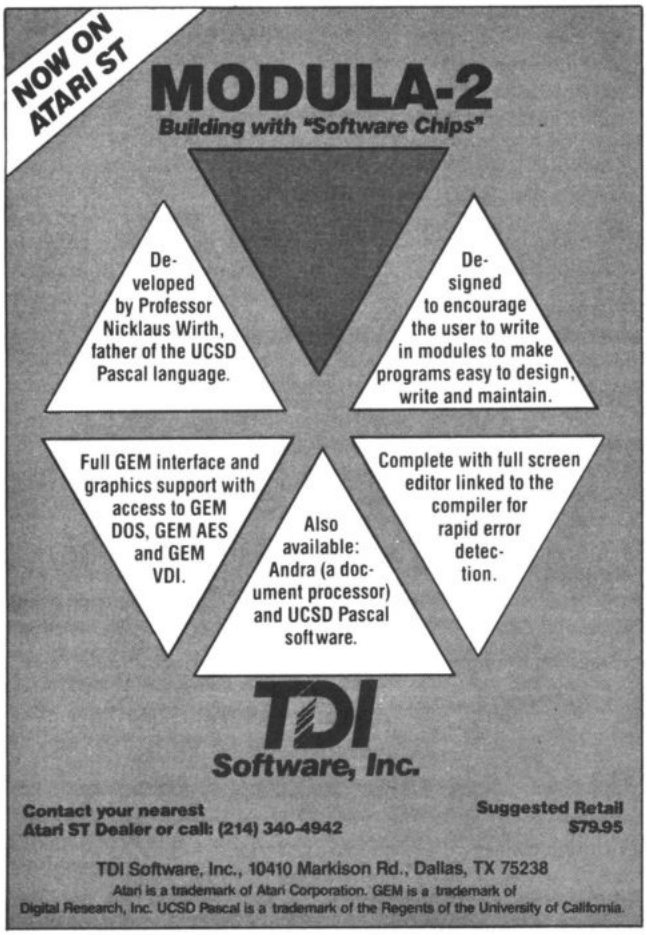
Another minor gripe about spells: one oft-used spell, inconveniently named Blorple, involves four keypresses with the last two fingers of your right hand in rapid succession. It's Mistype City.

The map of the game is very strange. There are no connections between major scenes. You have to teleport. This disjointed terrain will provide a challenge for mapmakers, and the teleport availability always gives you a convenient, immediate exit, in case you did something that someone bigger than you didn't like.

The ending is the most climactic anticlimax I've ever seen. The idea is catastrophic, even apocalyptic—the whole universe is at stake, but it just doesn't pack the whallop its potential promised. Still, after such an exciting, riveting game, topping it would have been difficult, if not impossible.

Though the magic is rapidly diffusing from the land, and the Enchanter's powers fail, the wizards at Infocom grow continually stronger. **Spellbreaker** is a vast, sprawling game, finely detailed, intricately designed. It can be easily and wholeheartedly recommended, a grand conclusion to a great series.

Greg Knauss is a senior in Rancho Palos Verdes, California. He's involved in journalism and drama, as well as computers.



WHAT IS CHECKSUM DATA?

Most program listings in **ANALOG Computing** are followed by a table of numbers appearing as DATA statements, called "CHECKSUM DATA." These numbers are to be used in conjunction with **D:CHECK** and **C:CHECK** (which appeared in **ANALOG Computing** issue 16 and the **ANALOG Compendium**) or with **Unicheck** (from issue 24, updated in issues 31 and 39).

D:CHECK and **C:CHECK** (written by Istvan Mohos and Tom Hudson) and **Unicheck** (by Tom Hudson) are designed to find and correct typing errors when readers are entering programs from the magazine. For those readers who would like copies of these articles, you may send for back issue 16, 24, 31 or 39 ($4.00 each) or the **ANALOG Compendium** ($14.95 plus $2.00 shipping and handling) from:

ANALOG Computing
P.O. Box 625
Holmes, PA 19045

BASIC XL/XE SWITCH

by Matthew J.W. Ratcliff

One of the nicest features of the newer XL/XE Atari computers is the built-in BASIC. If you've moved up from an old 400 or 800, then you probably find the OPTION key a nuisance when you want to go directly to DOS at power-up. If you forget, you have to type DOS from BASIC or reboot with the OPTION keypress.

The first method leaves BASIC enabled, which is not needed while in DOS. This makes file copying slower, since the 8K of RAM hidden by BASIC isn't used. The second method is just plain annoying. It's quite as irksome to attempt going to BASIC, only to find *no cartridge* installed. You have no choice but to reboot. This is a minor hassle, but the **BASIC XL/XE Switch** (known as **Switch** from here on) provides a simple solution for 800XLs, 64K 600XLs and the new 130XE computers.

Listing 1 is the BASIC data for XL/XE Switch. You should create the file under the filename SWITCH.COM. Please refer to M/L Editor on page 00 for typing instructions.

Whenever you go to DOS from BASIC, you need only load SWITCH.COM from Atari DOS, or just type *SWITCH* from OSS DOS-XL, and you'll have an additional 8K of RAM for file copying.

When you decide to go back to BASIC, just "flip the switch" again. Should you attempt a Switch when an external cartridge is installed, you will be reminded of the fact and returned to the DOS prompt.

Listing 2 is the MAC/65 source code. There are a few special memory locations new to the XL/XE machines. Location $3FA (1018), called GINTLK in Atari's 1200XL addendum to their technical notes, is the external cartridge flag.

A *0* here tells the OS that no external cartridge is installed. It's set at power-up and examined during a RESET key warmstart. A *1* here indicates that an external cartridge is installed.

Another special location is what I call LATCH, memory location $3F8 (1016). So far as I know, this has not been documented elsewhere. It's set by the OS during power-up. If OPTION is *not* pressed during power-up, the OS sets this location to *0*. If OPTION *is* pressed, then this location will contain a *1*. During a RESET keypress warmstart, the OS looks here to decide whether to re-enable the built-in BASIC, if no external cartridge is installed.

Some of you may be aware that memory location PORTB, $D301 (54017), is now used to control the ROM/RAM bank switching in XL/XE computers. As a technical note: PORTB, part of a 6520 PIA (Peripheral Interface Adapter), used to be joystick ports 3 and 4 on the Atari 400/800 computers. It now controls built-in BASIC on the XL/XE machines, and communicates with FREDDY for extended RAM bank switching on the 130XE computer. Setting bit 1 (*LDA PORTB, ORA #$02, STA PORTB*) of PORTB disables built-in BASIC. Clearing this bit (*LDA PORTB, AND #$FD, STA PORTB*) re-enables it.

The switching of the BASIC simply involves setting or clearing this bit in PORTB and the LATCH flag. To get the 8K of RAM for file copying after BA-

SIC is turned off, RAMTOP must be moved up and a graphics 0 command executed (see Lines 890-1040).

When BASIC is turned back on, RAMTOP must be moved back down. Note that a quick and dirty way to get to DOS with BASIC off is to use POKE 1016,1 and then press the RESET key (thanks to Ian Chadwick, author of *COMPUTE!'s Mapping the Atari*, for that tidbit). You still need to switch to get back to BASIC without rebooting.

If you have some disks with machine language utilities on them, which never require built-in BASIC, you might want to put **Switch** on that disk. If it's put on a disk as an AUTORUN.SYS file, you can forget about pressing the OPTION key altogether—and you won't have to enter DOS and then give the switch command. The AUTORUN **Switch** will see that BASIC is enabled, then disable it.

Note: it effectively "inverts" the function of the OPTION key. If **Switch** is an AUTORUN file, and you've pressed OPTION at power-up, it will see that BASIC is off and turn it on. Using it as an AUTORUN might get confusing.

This little utility will save you XL/XE owners many, many reboots—which are both time consuming and quite annoying. This "soft" switch will be much easier on your computer in the long run, not to mention your nerves.

Matthew Ratcliff is an electrical engineer in St. Louis, Missouri. When not using his spare time to write articles, he's president of ACE St. Louis and a remote SYSOP on Gateway City BBS, (314) 647-3290.

Listing 1.
BASIC listing.

```
1000 DATA 255,255,0,52,251,52,173,250,
3,240,56,32,65,53,76,27,3337
1010 DATA 52,197,248,244,229,242,238,2
25,236,160,195,225,242,244,161,155,926
5
1020 DATA 4,162,11,160,52,32,25,53,76,
53,52,160,190,206,239,160,8277
1030 DATA 211,247,233,244,227,232,174,
188,160,155,4,162,37,160,52,32,7650
1040 DATA 25,53,96,173,1,211,41,2,208,
49,173,1,211,9,2,141,3157
1050 DATA 1,211,169,192,133,106,32,65,
53,76,102,52,252,160,194,193,9290
1060 DATA 211,201,195,160,207,198,198,
160,252,29,155,4,162,86,160,52,8640
1070 DATA 32,25,53,169,1,141,248,3,76,
8,53,173,1,211,41,253,5651
1080 DATA 141,1,211,169,160,133,106,32
,65,53,76,150,52,252,160,194,8587
1090 DATA 193,211,201,195,160,207,206,
160,252,29,155,4,162,135,160,52,9391
1100 DATA 32,25,53,169,0,141,248,3,173
,226,168,201,96,208,74,76,9186
1110 DATA 179,52,82,69,86,46,66,155,4,
162,172,160,52,32,25,53,2138
1120 DATA 76,206,52,160,195,239,238,24
4,225,227,244,160,193,212,193,210,9062
1130 DATA 201,160,155,4,162,189,160,52
,32,25,53,76,233,52,160,160,6362
1140 DATA 230,239,242,160,210,197,214,
174,195,160,161,160,160,155,4,162,2284
1150 DATA 216,160,52,32,25,53,76,8,53,
201,234,208,17,76,1,53,2714
1160 DATA 82,69,252,52,189,53,86,46,67
,155,4,162,250,160,52,32,5500
1170 DATA 25,53,76,17,53,29,29,29,29,1
55,4,162,11,160,53,32,9960
1180 DATA 25,53,96,142,68,3,134,208,14
0,69,3,132,209,160,0,140,5891
1190 DATA 72,3,140,73,3,177,208,201,4,
240,6,238,72,3,200,208,8785
1200 DATA 244,169,11,162,0,141,66,3,76
,86,228,162,96,169,12,157,6097
1210 DATA 66,3,32,86,228,162,96,169,3,
157,66,3,169,187,157,68,6475
1220 DATA 3,169,53,157,69,3,169,0,157,
75,3,169,28,157,74,3,1838
1230 DATA 32,86,228,162,112,160,53,76,
25,53,252,160,216,204,175,216,2457
1240 DATA 197,160,194,193,211,201,195,
160,211,247,233,244,227,232,229,242,13
83
1250 DATA 160,194,249,160,205,225,244,
170,210,225,244,160,252,155,252,160,91
58
1260 DATA 212,239,240,160,184,203,160,
210,207,205,175,210,193,205,160,195,75
05
1270 DATA 239,238,244,242,239,236,160,
213,244,233,236,233,244,249,160,160,65
6
1280 DATA 252,29,29,155,4,83,58,0,224,
2,225,2,0,52,0,0,8484

1290 REM * 464 BYTES
```

Listing 2.
Assembly listing.

```
**********************************
* BASIC Switcher for the 800XL   *
* 64k-600XL, & 130XE Computers.  *
*                                *
*                                *
* By Matthew J. W. Ratcliff      *
*      3/9/85                    *
**********************************
* E=
          .OPT NO LIST
          .INCLUDE HD:SYSEQU.M65
          .INCLUDE HD:IOMAC.LIB
          .ORG $3400
          .OPT NO MLIST
          .OPT OBJ
          .OPT LIST
          .TITLE "XL/XE BASIC Switcher"
PORTB     =    $D301     :ROM/RAM ctrl
GINTLK    =    $03FA     :EXT CART FLAG
LATCH     =    $03F8     :LATCH ON/OFF
BASREV    =    $A8E2     :BASIC revision
TXPNT     =    $D0       :TEXT LEN POINTER
RAMTOP    =    106       :TOP OF RAM
```

```
          .MACRO PRN0
            .IF %0<>1
            .ERROR "BAS PRN0 CALL!"
            .ENDIF
          JMP @SKPTX
@TXT      .BYTE %$1.$9B,$04
@SKPTX    LDX # <@TXT
          LDY # >@TXT
          JSR PRINTXT
          .ENDM
BEGIN     LDA GINTLK   :EXT CART HERE?
          BEQ CNTNU    :NO, CONTINUE
          JSR GRAF0
           PRN0  "External Cart!"
           PRN0  "  >No Switch.<  "
          RTS          :YES. HOME JAMES!
CNTNU     LDA PORTB    :BASIC OFF?
          AND #$02
          BNE TURNON   :YES-TURN IT ON
          LDA PORTB    :ON-TURN IT OFF
          ORA #$02
          STA PORTB
          LDA #$C0
          STA RAMTOP
          JSR GRAF0
           PRN0  "| BASIC OFF |↓"
          LDA #1
          STA LATCH    :LATCH IT OFF
          JMP EXIT
TURNON    LDA PORTB    :BASIC ON
          AND #$FD     :WAS OFF-GO ON
          STA PORTB
          LDA #$A0
          STA RAMTOP
          JSR GRAF0
           PRN0  "| BASIC ON |↓"
          LDA #0
          STA LATCH    :LATCH IT ON
          LDA BASREV   :SHOW REVISION #
          CMP #96      :REV.B ?
          BNE REVC     :REV.C ?
           PRN0  "REV.B"
           PRN0  " Contact ATARI "
           PRN0  "  for REV.C !  "
          JMP EXIT
REVC      CMP #234     :REV.C?
          BNE EXIT     :NOT DETERMINED.
           PRN0  "REV.C"
EXIT       PRN0  "↓↓↓↓"
          RTS
PRINTXT   STX ICBADR   :PRINT TO #0
          STX TXPNT
          STY ICBADR+1
          STY TXPNT+1
          LDY #0       :FIND LENGTH
          STY ICBLEN
          STY ICBLEN+1
LEN       LDA (TXPNT),Y
          CMP #$04     :ETX-END OF TEXT
          BEQ OUTPUT
          INC ICBLEN
          INY
          BNE LEN      :256 CHARS MAX.
OUTPUT    LDA #11      :PUT RECORD
          LDX #0
          STA ICCOM
          JMP CIO
GRAF0     LDX #$60     :CLOSE #6-SCREEN
          LDA #CCLOSE
          STA ICCOM,X
          JSR CIO
          LDX #$60
          LDA #COPN    :OPEN S:
          STA ICCOM,X
          LDA # <SCRN
          STA ICBADR,X
          LDA # >SCRN
          STA ICBADR+1,X
          LDA #0
          STA ICAUX2,X :GR. 0 FOR S:
          LDA #$1C     :FLIP BIT 4
: & ALLOW READ/WRITE
          STA ICAUX1,X
          JSR CIO      :NOW OPEN IT
          LDX # <TITLE
          LDY # >TITLE
          JMP PRINTXT
TITLE     .BYTE "| XL/XE BASIC "
          .BYTE "Switcher By Mat*Rat |"
          .BYTE $9B
          .BYTE "| Top 8K ROM/RAM "
          .BYTE "Control Utility  |"
          .BYTE "↓↓",$9B,$04
SCRN      .BYTE "S:",0
          *=  $02E0
          .WORD BEGIN
          .END
```

•

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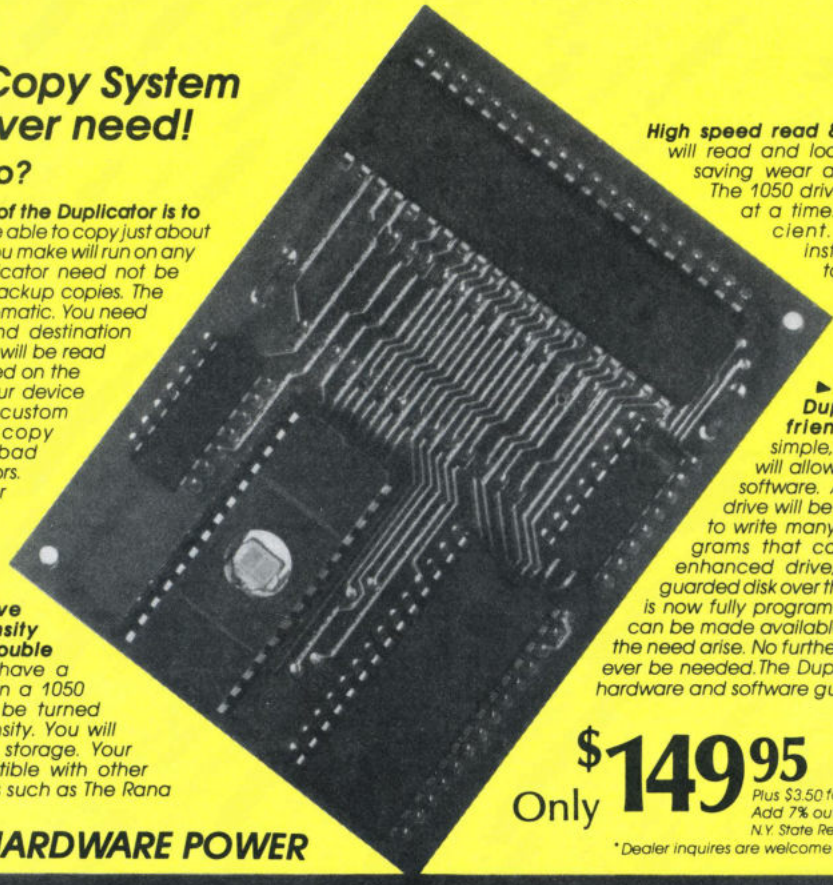
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HACKERS: Heroes of the Computer Revolution

A book by Steven Levy
DELL PUBLISHING CO., INC.
1 Dag Hammarskjold Plaza
New York, NY 10017
448 ppg. $4.50 U.S., $5.95 Canada

by Pamela Rice Frank

Talk to anyone who knows me; they'll confirm that I read just about anything I can get my hands (eyes) on. If I'm not devouring a novel, I'm concentrating on one of the many monthly computer magazines. (Since I'm still not too technically oriented, many times it's more like *wading* through the stuff. Someday, I theorize, it'll all soak in, and—*voila!*—*a genius will emerge.*)

I read inspirational books, books on the Atari, *People*, **ANALOG Computing**, cereal boxes. . .you get the idea. One book I was dying to get my hands on, but couldn't afford in the hard cover edition, is *Hackers: Heroes of the Computer Revolution* by Steven Levy.

The local library didn't have it and—I guess, since I sometimes have so many requests—never got around to ordering it. The book's popularity was reflected by the fact that none of the libraries connected with the interlibrary loan program would let it out. It seems *everyone* wanted to read it. Now that I have, I can understand why.

Hackers is now available for $4.50 in a Dell paperback edition. It reads like a fantasy, but is all the more absorbing because this stuff really happened.

The first third of *Hackers* is devoted to those techies who emerged as pioneers of the hacker ethic. Total devotees, they existed only to compute. Their sleep schedules were adjusted to allow for marathon coding sessions.

They lived to bum code, content to share knowledge with those who earned the respect of this domain by demonstrating abilities to improve, refine, and expand the capabilities of the new computing machines.

Members of the MIT Tech Model Railroad Club's "Signals and Power Subcommittee," those involved in devising and maintaining the intricate mazes of connections to power the scale railroad setup, drifted into the EAM (Electronic Accounting Machinery) room simply by following the same curious path that had started them tracing phone lines. A desire to determine how things worked dictated that you get your hands on it and *learn*.

Those who began working with Professor John McCarthy in 1959, in the arrogant (these guys had the audacity to believe machines could be smart!) new field of Artificial Intelligence (AI) would be responsible for the cataclysmic discoveries that set the stage for the home computer revolution two decades later. With monastic devotion and a total hostility to the IBM batch-processed mentality, these pioneers forged the mold of an entirely new, exciting mentality.

Steven Levy, the author of *Hackers*, creates such a vivid picture of these early computer explorations that at times I felt a rush of excitement such as the hackers must have known. These guys were doers.

Formal education was set aside for this real-world/real-time learning. Nothing seemed to deter their quest for completing the task at hand. Hackers weren't hung up on accomplishments; they *were* accomplishing.

If a part was needed, the Midnight Requisitioning Committee saw that it was acquired (appropriated). If a change in the system was necessary, the Midnight Computer Wiring Society made sure it was done. These improvisations were responsible for the first computer chess game, the first joystick, the first robotics arm, etc. It's a real joy sharing such discoveries through the book.

One of my favorite anecdotes from *Hackers* involves a robotics arm devised to play ping-pong. The system could detect the light reflected off the ping-pong ball and react accordingly. This was fine, until a bald professor walked too close to the table and almost lost his head. Whack!

Since I'm also a trivia nut (undefeated family champion—I also occasionally brag), I can't resist mentioning the fact that the same fascination hackers had for coding followed them in their pursuit of cheap food. When they weren't feeding

the system, they were feeding themselves Chinese food.

It was only logical that they learn to read Chinese. . .They found the hieroglyphs almost as intriguing as the other symbols they were so wrapped up in.

I'm sure it's obvious by now that I could go on and on about this book. I loved it. There's plenty of information on Atari included, as well.

John Harris's **Frogger** and other successes are discussed. The old Atari corporate mentality (under Warner Communications), which led to mass migration of their star programmers, is also mentioned.

This book abounds in rags to riches (and, sometimes, back to rags) stories. The successes that began in the Homebrew Computer Club include many that are already familiar.

Although we all recognize that, when compared with the Atari, the Apple is just a toy, it's still fascinating to discover that company's remarkably humble beginnings. Steve Wozniak from Hewlett-Packard was passing plans around at meetings, for his vision of a home computer. Once he teamed with a gentleman from Atari, Steve Jobs, the rest became history.

Two interesting notes from this "era" include: first is the fact that, except for the marketing genius of Jobs, the Sol computer might have been the one to start the revolution. Second, in hindsight, it seems surprising that many at Homebrew failed to realize what "Woz" was on to.

Because the club was founded primarily by those who'd been building their own simple computers at home—mostly from kits like the Altair—there were many members who simply didn't believe a market existed for a computer that hadn't been built by its user.

Once the home computer boom began, it was logical that the software bonanza would follow. All the new computerists needed something to do with their machines.

Ken and Roberta Williams combined graphics with text in their adventure games. With Roberta copying disks at home, adding the typewritten labels, sticking them into Ziploc bags and inserting xeroxed instructions to the packages to be mailed out, the Williamses made $20,000 the second month after they "released" their new game. Sierra On-Line evolved from these efforts.

Scruffy kids hacking around on the new machines were earning megabuck 30% commissions for their efforts.

I found only one aspect of *Hackers* distressing. I realize that Steven Levy's job was to tell us the story of the computer revolution—a job he's done remarkably well. This, I suppose, really didn't permit him the license a reviewer has, to criticize an aspect of the revolution.

Actually, "criticize" probably isn't the correct term to use, but it'll have to suffice. The aspect I found distressing in *Hackers* was the casual way drug use was mentioned. The book glamorizes kids turning on to computers and (for many) finally finding a place to "fit in." I find it hard to imagine these people even *considering* using anything that would fry their brains. They depended on their intellect for existence and identity.

I would have liked to see some mention of the consequences of this means of coping with the money and success these kids acquired. I feel, since drug use was simply described as part of the fun, a teenager hoping to emulate these people might find drugs a part of the hoped-for glamour—especially if the success eludes him. (So much for my soapbox!)

Read *Hackers*. It was the best four-hundred-plus pages I've read in a long time.

Pamela Rice Frank, a free-lance writer and part-time police dispatcher, works on two computer-oriented newsletters. She has owned her Atari 800XL for 2½ years.

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by Daniel A. Silvestri

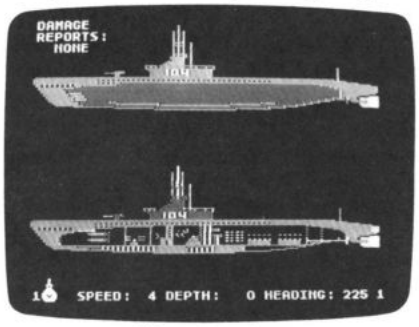
World War II rages on, and shipping lanes in the South Pacific increase in importance with each passing day. The engines on your sub are humming, the battery's fully charged, and the aft and bow torpedo tubes are loaded and waiting. You've been assigned convoy action duty and are waiting for your sonar report to verify the location of your targets. Then it happens. . .Sonar picks up a convoy of five ships with a destroyer escort, about ten thousand yards east of you. "Hard left rudder. Engines flank speed; dive to periscope depth." The hunt is on!

Silent Service by MicroProse is by far the best submarine simulation game I've seen thus far. A superb job has been done integrating play/action and historical facts which affect the outcome of battles. So much research has gone into this game, that it's actually a history lesson on World War II submarine construction and capabilities.

You'll also become familiar with South Pacific islands, land masses, important shipping lanes, and Allied naval bases. And all this learning is pain free, as you feel the chill of the hunt.

Silent Service gets its name from "The American Silent Service," which is what the U.S. submarine fleet was called in the second world war. The primary objective of the fleet was to disrupt the Japanese Merchant Marine, in order to prevent supplies and additional troops from getting to key battlefronts. This simulation offers a variety of scenarios, based on actual historical convoy battles and war patrols. For the Ensign assignee, target identification practice is your first stop.

Target Identification Practice lets you get into the simulation by offering a chance not only to take target practice (Torpedo/Gun Practice), but to learn to recognize and identify enemy ships.



Silent Service.

It's so important to know which ship is a destroyer and which is a cargo or troop ship, that when you elect to go on War Patrols, you must first take a quiz to see if your ability to identify targets has been developed enough to take on this dangerous assignment. If you flunk the quiz, you're reassigned to Target Identification Practice just outside the American base at Midway Island. No fooling around here—your commanding officers are serious.

The Convoy Action scenario offers six different convoy battles, based *precisely* on historical battles that occurred—down to the actual sub name, whether it was a day or night skirmish (which affects visibility), tonnage actually sunk, year the battle took place, and type of sub that participated.

Both the year and type are important, because the simulation takes into account advancements made in submarine warfare during the war. A battle that occurs early in the war would be fought using a sub with limited diving capabilities (300 feet or less), "steam" torpedoes that leave a bubbly track which can be traced to the firing sub, and so on. Incredible! And this is only the beginning of the game's possibilities.

The War Patrol selection allows you to roam the South Pacific waters at will, searching for unsuspecting convoys. You begin from any of three American naval bases and end your "run" by returning to base when you feel it's necessary for repairs, fuel, etc. Part of your commanding ability is to know when to quit. This selection is extremely tough.

In addition to the variety of choices in scenarios, **Silent Service** offers you "skill" and "reality" levels. The skill levels affect such things as: damage sustained from enemy depth charge attacks, accuracy of your torpedoes, skill of the enemy crews, and so on.

The reality levels control factors which reflect weather conditions like visibility, evasive techniques of the enemy (like zig-zagging convoys), dud torpedoes (a definite *reality* in the war), expert destroyers with seasoned crews which can hunt you down more effectively, and more. Based on the skill and reality levels selected, an overall "difficulty" level is produced. This is used to determine your ranking when the run is complete, or you've been sunk.

Six graphic screens offer the scene from the conning tower (control center), periscope and binocular views, battle station bridge, instruments and gauges, damage control and sonar map. The latter can be zoomed out on the area of the battle.

Instrumentation includes battery charge level, speed, depth, depth below the keel, torpedo ready indicator, fuel levels, compass, clock, water temperature, etc. Ships explode and sink when struck with torpedoes. . . if you stick around to watch.

You control your sub by using a combination of the keyboard and the joystick. A concise "keyboard command" table is included to make this option easy to use. Of course you can dive, surface, change speeds, reverse engines, even blow the emergency tanks to prevent an otherwise fatal dive and release fake debris to fool the destroyer into thinking that it has sunk your sub.

A valid feeling is inspired by this simulation—it makes your pulse pound as the enemy above launches a depth charge attack and sonar reports depth charges exploding all around you. Your decision-making abilities are tested every nautical know of the way. Very little luck is involved in **Silent Service**. Your skill in maneuvering your sub, your decision to attack from a submerged or surface position, your ability to outrun destroyers closing in on you—all are on the line.

If you do well, your names will be entered into the "submarine Hall of Fame," which will record your difficulty level and tonnage sunk, as well. You definitely have your work cut out for you in this simulation, but it's great.

In general, the documentation is excellent. It includes maps, submarine tactics, charts on actual U.S. subs and tonnage they sunk, and more. It's by far the best documentation I've seen for such a game.

The war patrol missions section, however, is not as clearly written as the rest. I couldn't figure out how to move quickly from my base to the shipping lanes. . . It was taking me an hour of real time. I finally placed a call to MicroProse, and they courteously informed me that, when you select war patrol, you'll be placed on the big map. You can then move your blinking dot with the joystick to quickly head for the action. When you encounter a convoy, you may engage it by pressing the fire button, or ignore it (the screen will flash red when you find the enemy). After an engagement, use the joystick from the coming tower to select the option to "resume patrol," and you'll be returned to the big map, where you can move quickly again. I'm totally happy now.

The only negative thing I can say about **Silent Service** has nothing to do with its game play. I tried loading the current version on a Trak drive, and some features of the game didn't work—which rendered it unplayable. I've heard that the same thing happens with Rana drives. I did successfully load it on my Atari 1050, however, and it ran well. You might check with MicroProse about this.

All in all, this submarine simulation really puts you in control, recreates a feeling of reality and gives your dollar an excellent run for the money— considering the great control **Silent Service** gives you over skill and reality factors. This is an excellent strategy game that deserves to surface victoriously to the top!

Daniel A. Silvestri has been working with computers for three years now, and is employed by a major publisher of business software for MS DOS machines. His interests in computers lie in business applications, financial planning, adventure gaming and strategic battle simulations.

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Bonsai

by R.I. MacDonald

This program constructs trees (of the botanical variety), which can then be drawn with a 3-D perspective drawing program (such as **Solid States** in **ANALOG Computing**'s issue 16). Drawing trees is not as trivial as it might seem.

A realistic representation of a tree can come only from a data set constructed with due attention to some model of tree growth. Trees are complex, and data sets that represent them convincingly are too large to be entered by hand in the usual way for **Solid States** images. **Bonsai** is a BASIC program that creates the data sets to represent many kinds of trees, according to a new model of growth designed for computer drawing in architecture.

From this model, a great deal can be discovered about the growth of plants. Many different kinds of trees can be generated with a few parameters. Finding the correct parameter values required to generate different species leads to some understanding of the construction of real trees. The effects of weather and gravity can be simulated. New types of alien botany can even be constructed.

If a collection of tree datasets is made, these can be included in drawings made with **Solid States**, with great effects. Computer pictures in general tend to be representations of artificial things, mainly because these are easier to define in coordinates. Natural objects like trees can be impressive.

Organization.

There are two programs given here. The first, which is **Bonsai** proper, creates the tree data sets and stores them on disk. To create a realistic tree requires at least 128 points and an equal number of lines to connect them. Each point requires a representation of the X-, Y-, and Z-coordinate, and each line has two ends and a width parameter, leading to a data set occupying almost 5K.

Generally speaking, only the data representing one tree can be held in memory at a time, with the perspective drawing program in place. It's convenient to store the data sets as disk files to be called up by the drawing routine.

The second program, called PERSPEC, is a 3-D drawing system using **Solid States** as its core. It has an altered file structure matching that of **Bonsai**, with some added routines to permit drawing with lines of variable width, as well as moving, scaling and rotating the data to be drawn, so that many items can be combined into a single drawing.

The program isn't interactive like the original **Solid States**. It's organized as a group of subroutines to be called by a main drawing program, which was writ-

ten to describe the particular picture being created, and uses previously created files as sources of data.

This approach makes it possible to write a program to draw complex pictures and leave it alone to produce them. With so much data to deal with, the process can be slow. One can cook supper, shovel the driveway and play two full games of Monopoly, while the computer gets on with things.

The tree creation program **Bonsai**, on the other hand, can be used either interactively or under the control of a main program. To use it at all, however, requires an understanding of the model basic to it.

GMT models.

Bonsai employs a tree growth model called GMT2 that was developed by M. Aono and T. Kunii at the

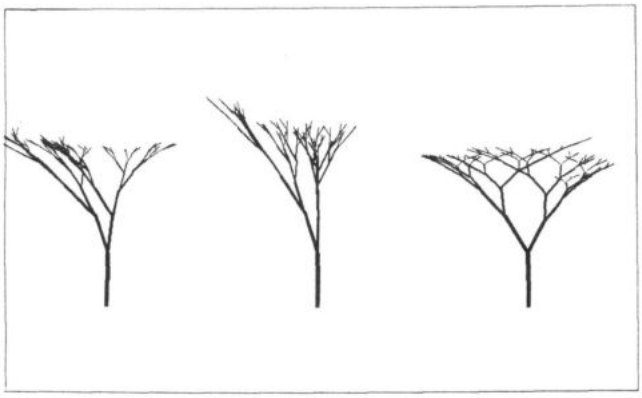


Figure 1.

University of Tokyo. This work is described fully in the *Computer Graphics and Applications Journal* of the Institute of Electrical and Electronic Engineers for May 1984. A brief description of the principles is given here.

While trees appear to be fairly random in construction, random lines actually make a very unsatisfactory representation of a tree. This is because trees, and all plants, follow quite systematic rules during growth. The trees generated by **Bonsai** are not random at all, but grow entirely deterministically, according to the following simple rules.

(1) Two child branches are generated at the end of every branch.

(2) As the tree grows, this bifurcation occurs simultaneously at the end of all branches.

(3) The child branches are shorter and narrower than the parent branches by given ratios. (In the model, it's actually possible to change the ratios at each level of branching.)

(4) The child branches make specified (possibly different) angles to the left and right with the direction of the parent branch, and lie in a plane containing the parent branch. This plane (the maximal gradient plane) lies along the parent branch in such a way that a marble placed at the high end of that branch would roll on the plane right along the branch to the other end.

(5) Rule four has to be varied when one branching angle is zero, or near zero. Such a situation occurs in trees like evergreens, in which one child branch always continues along the line of the parent, forming a central, pillarlike trunk. This type of branching is called *monopodial*. For monopodial branching, an angle must be defined (the divergence angle), by which the position of each new branch advances around the trunk from the direction defined by the previous child.

Many types of tree can be represented by this simple scheme. In Figure 1, some examples are given.

The realism of the trees can be enhanced by adding a dash of imperfection. As noted, mere randomness imposed as a perturbation on the tree does not add much to the visual appearance. Much more dramatic effects are obtained by adding "external influences." **Bonsai** permits the tips of the branches to be deviated by a fixed amount in the X-, Y- or Z-direction from their calculated position at each branching stage.

This uniform deviation produces a curve in the tree or its branches that's reminiscent of the effects of wind, or, if it's in the downward direction, of gravity. Non-uniform deviation is also possible. In this process, imaginary "controllers" are located at points around the tree. Each such location either attracts or repels the tips of the branches according to their distance from it. The effect on the tree can only be described as "added character." The effects of adding uniform and non-uniform deviation to the trees of Figure 1 are shown in Figure 2.

Tree parameters.

Each tree is defined by twenty parameters. Since a continuous range of values is permissible for most of them, there are very many possible trees. Not all look good. Part of the fun is finding out what ranges of parameter values are reasonable. An understanding of the function of each parameter is necessary. In the following, each parameter is described, and the name of the corresponding variable in **Bonsai** is given.

Number of levels (L). This is the number of generations of branching that occur. The number of data points goes as 2^L, so vast amounts of data will be

generated if L is too large. **Bonsai** can coexist in memory with the data for nine levels of branching in a 48K machine, but the drawing program PERSPEC can only handle seven levels at a time.

Initial diameter (WID). This is the width of the trunk at the ground. A value of 6 is a good starting point.

Contraction ratio of diameter (DIAM). At each level of branching, a new diameter for the branch is established by replacing the current value of WID (see above) by WID*DIAM. Normally, you would set DIAM to be between 0 and 1. A value of 0.7 works well.

Angles, left and right (H1,H2). These are the angles that the child branches make to the left and right of the line of the parent branch. If one angle is set to 0, monopodial branching results. In such cases, you should specify a divergence angle (see below), otherwise all the branches come out on the same side of the tree. any branching angle between 0 and 90 degrees is reasonable.

Angle decrements, left and right (DL,DR). At each branching, the branching angles will be decreased by the amounts given here. Most real trees seem to have almost no decrement of branching angle with growth, but it's an interesting parameter to play with. Negative values give increments instead of decrements.

Shortening ratios, left and right (R1,R2). The length of each child branch will be shorter than that of the parent branch by these ratios. The trees of North America seem to correspond to values between 0.6 and 0.9.

Shortening ratios, left and right (RD1,RD2). The shortening ratios are incremented by these values at each stage of branching. This is an advanced parameter I haven't investigated yet. Zero works.

Divergence angle (DIV). This one's very important for evergreens and some other trees. When one branching angle is 0 or near 0, the tree has a main stem growing more or less straight up, with side branches growing out of the stem. If DIV is set to 0, all these branches will come out the same side of the tree. When specified, DIV sets the angle by which the direction of each side branch is rotated around the trunk from the one below it.

It only applies to the trunk, but when it's been given a value, the divergence angle also signals the program to produce sub-side branches on opposite sides of the side branches, to increase the symmetry of the tree further. Divergence is a feature of many real plants, and it's interesting that, expressed as fractions of a full circle, these angles for various plants are always members of the Fibonacci sequence $\frac{1}{2}$, $\frac{1}{3}$, $\frac{3}{5}$, $\frac{3}{8}$. . . Thus, 180,120,140,135. . .degrees are good values.

When DIV is set nonzero, the program always takes the left branch as the trunk, reversing the branching angles if the right one's smaller. This may cause confusion if other parameters, such as shortening ratio, are not symmetrical in the branching, since it's up to you to get these right.

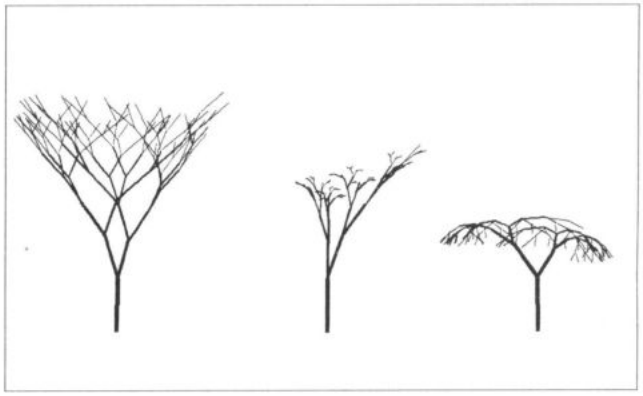


Figure 2.

Uniform deviation (UDX,UDY,UDZ). At every branching stage, the positions of the tips of the branches will be calculated according to the five rules of GMT2. Then they'll be moved by the amounts given here in the X-, Y- and Z-directions. Small values work best, up to 0.3, say. Negative values are also permissible, of course.

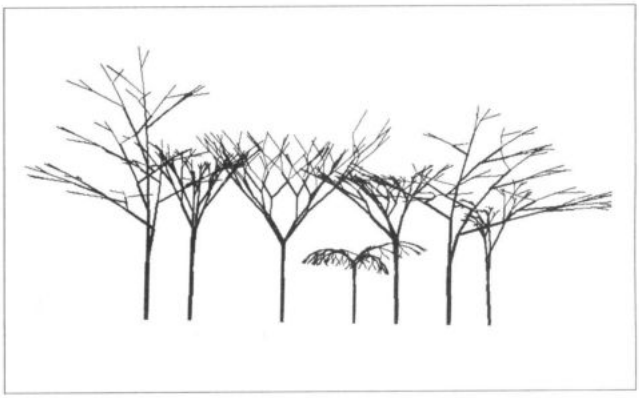


Figure 3.

Number of controllers (MM). This is the number of discrete attractors or repellers used. Set to 0 if none needed.

Strength and coordinates of controllers (matrices FACTOR(MM), QX(MM), QZ(MM).). Values of the strength and coordinates go in matrices. There's no reasonable limit on the number permissible. The

strengths should be negative for a repeller, positive for an attractor, and small in magnitude if the controller's near the tree—for example, about .05.

How to use the program.

Bonsai is given in Listing 1. You should list it to disk after typing, since you'll want to combine it with various controller programs to do different things.

The most straightforward way to use **Bonsai** is to RUN it and respond *N* to the query *AUTORUN?* You'll be prompted for the parameters, and the disk drive number and filename they're stored under. The program will then generate the corresponding tree data and store it in the disk file specified.

A more satisfactory way to proceed is to generate a lot of trees in one run. To do this, you include a controller program like the one shown in Listing 2 at the end of **Bonsai**. (Type it in, LIST it to disk, then ENTER both **Bonsai** and Listing 2 from disk.)

In the controller program, the parameters of many trees are stored in data statements. Listing 2 will generate ten trees that are a good starting library and store them in files called NO1 through NO10. When you RUN **Bonsai**, respond *Y* to the *AUTORUN?* query, and control is transferred to your controller program after Line 20000. (This line should not be altered or removed, by the way.)

A few conveniences are provided to aid in writing programs like Listing 2. To avoid the necessity of remembering line numbers in **Bonsai**, these are contained in mnemonic variables. You need only include the statement GOSUB GO to generate the tree data, and GOSUB WRITE to write it to a disk file.

Before the latter, you must have specified the drive number in the variable DRIVE in the form *DRIVE$ = "D1:"*, and the name of the file in the variable FILE$. Eight letters here only; no file extenders are allowed. Note that **Bonsai** files are incompatible with the original **Solid States** files. In **Bonsai**, separate files distinguished by the extenders .PNT and .LIN are used for point and line data, and the .LIN files contain the width data, as well.

(continued on next page)

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PERSPEC.

After typing *PERSPEC*, which is given in Listing 3, you should also LIST it to disk. This version of **Solid States** runs under the control of a control program, which you enter after Line 30000 in a similar way to the **Bonsai** controller programs. A very simple one is shown in Listing 4. This program prompts for the name of a tree file and then draws it.

PERSPEC is really **Solid States**, modified to provide for variable line width drawing and convenient scaling, rotation and translation of the data, as well as drawing many data files to one picture. For convenience, the subroutines have been given names, as in **Bonsai**. These subroutine calls and the associated variables which must be set before use are given in Table 1.

Subroutine Call	Variables	Purpose
GOSUB PLOTON		Initializes 1020 plotter.
GOSUB PLOTOFF		Disables 1020 plotter.
GOSUB DUMP		Epson-compatible screen dump.
GOSUB RED,BLUE GREEN,BLACK		Change pen colour on 1020 plotter.
GOSUB BIG		Sets large format.
GOSUB SMALL		Sets small format (thick lines suppressed).
GOSUB PAGE		New plot on 1020.
GOSUB FRAME		Draws frame.
GOSUB GETFILE	FILE$,DRIVE$	Gets **Bonsai** file.
GOSUB OLDFILE	FILE$,DRIVE$ WIDTH	Get **Solid States** file.
GOSUB ROTATE	THETA (angle)	Rotate data.
GOSUB GO	SCL,ZOOM (scale & zoom) XS,YS,ZS (tree location) OX,OY,OZ (observer location) VX,VY,VZ (point observed)	Draw data.

Table 1.

Note that the variables must be established before the subroutine calls. The variable DIVE$ must be in the form *D1:* and FILE$ is limited to eight letters, no extenders. THETA is the rotation angle about the trunk, in degrees; SCL is a scale factor applied to the whole tree; and XS,YS,ZS are the coordinates of the root of the tree as it will be drawn. In scaling and moving, remember that the raw tree data is such that the distance from the root along the trunk to the first branch is always 1 before scaling.

The drawing parameters ZOOM (telescope-type magnification— use 1, normally), OX,OY,OZ (observer location), and VX,VY,VZ (point looked at) must also be set before calling GO.

Finally, Listing 5 is a control program for PERSPEC, that uses the trees generated by **Bonsai** and Listing 2 to make the picture you see in Figure 3.

Happy gardening!

Dr. MacDonald is a research scientist in integrated optics for the Department of Communications of Canada in Ottawa. He's owned a 48K Atari 400 for two years, time-shared with two children, and is a member of the National Capital Atari Users' Group (NCAUG).

Listing 1.

```
1 REM ****************************
2 REM *         BONSAI           *
3 REM *           BY             *
4 REM *    R.I.MACDONALD         *
5 REM ****************************
9 WRITE=2310:GO=58:DIM DRIVE$(3),FILE$
(12),P$(1),F$(10),F1$(20):? "AUTORUN?"
:INPUT P$:IF P$="Y" THEN 20000
10 TRAP 20:? :? :? "NUMBER OF LEVELS":
INPUT L:DIM R(L,1),H(L,1)
24 TRAP 25:? :? "INITIAL DIAMETER":INP
UT WID
25 TRAP 30:? :? " CONTRACTION RATIO OF
 DIAMETER":INPUT DIAM
30 TRAP 40:? :? :? "LEFT ANGLE":INPUT
H1:? :? :? "LEFT ANGLE DECREMENT"
40 TRAP 45:? :? :? "RIGHT ANGLE":INPUT
 H2:H2=H2:? :? :? "RIGHT ANGLE DECREME
NT":INPUT DR
45 TRAP 46:? :? :? "LEFT RATIO":INPUT
R1:? :? :? "RATIO INCREMENT (DECREMENT
)":INPUT RD1
46 TRAP 47:? :? :? "RIGHT RATIO":INPUT
 R2:? :? :? "RATIO INCREMENT (DECREMEN
T)":INPUT RD2
47 TRAP 48:? :? :? "DIVERGENCE ANGLE?"
:INPUT DIV:IF (DIV<>0) AND ABS(H2)<ABS
(H1) THEN GOSUB 400
48 TRAP 54:? :? :? "DEVIATIONS":? "UNI
FORM:DX,DY,DZ":INPUT UDX,UDY,UDZ
49 TRAP 54:? :? :? "CONTROLLED:HOW MAN
Y CONTROLLERS?":INPUT MM:IF MM=0 THEN
54
50 TRAP 49:? :? :? "GIVE STRENGTH AND
X,Y,Z CO-ORDINATE FOR EACH":DIM FACTOR
(MM),QX(MM),QY(MM),QZ(MM)
52 FOR M=1 TO MM:INPUT S,X,Y,Z:FACTOR(
M)=S:QX(M)=X:QY(M)=Y:QZ(M)=Z:NEXT M
54 ? "DRIVE?":INPUT DRIVE$:? "ENTER FI
LENAME TO SAVE":INPUT FILE$
55 REM ************************
56 REM *   MAIN PROGRAMME     *
57 REM ************************
58 F=2:POKE 559,0:TRAP 59:DIM R(L,1),H
(L,1)
59 TRAP 3000
60 H2=-H2:DEG :FOR J=1 TO L:H(J,0)=H1+
(J-1)*DL:H(J,1)=H2-(J-1)*DR:R(J,0)=R1+
(J-1)*RD1:R(J,1)=R2+(J-1)*RD2:NEXT J
100 TRAP 40000:PS=2^L:LS=PS-1
110 TRAP 120:DIM X(PS),Y(PS),Z(PS),LN(
PS,2)
120 X(1)=0:X(2)=0:Y(1)=0:Y(2)=0:Z(1)=0
:Z(2)=1:J=2:GOSUB 245
122 W=1:T=1:Q=2:H4=1:JP=2:JG=1:C=0:J=3
:GOSUB 300:C=1:J=4:DIVFLG=1:GOSUB 300
123 LN(0,0)=0:LN(0,1)=0:LN(1,0)=0:LN(1
,1)=0:LN(2,0)=1:LN(2,1)=2
124 GOSUB 300:LN(0,2)=WID:LN(1,2)=WID:
```

```
LN(2,2)=WID:WID=WID*DIAM:LN(3,2)=WID:L
N(4,2)=WID
125 OLDIV=0:FOR Q=3 TO L:H4=(-1)^Q
126 WID=WID*DIAM:IF (DIV>0) THEN DIVFL
G=1
130 H3=0:FOR JG=INT(F^(Q-3)+1.001) TO
INT(F^(Q-2)+1.0E-03):GP=JG-(F^(Q-3)+1)
136 FOR P=0 TO 1:FOR C=0 TO 1
140 J=INT(F^(Q-1)+1.001+C+2*P+4*GP):JP
=INT(F^(Q-2)+1.001+P+2*GP)
145 LN(J,0)=JP:LN(J,1)=J:LN(J,2)=WID
150 U=X(JP)-X(JG):V=Y(JP)-Y(JG):W=Z(JP
)-Z(JG):T=(U*U+V*V+W*W)^0.5
160 S=(U*U+V*V)^0.5:IF S=0 THEN GOSUB
305:GOTO 215
180 S=1/S
181 HHH=H(Q,C):IF (C<>1) OR (DIV=0) TH
EN 190
182 HHH=HHH*H4:IF H3=0 THEN HHH=ABS(HH
H)
190 X(J)=UDX+X(JP)+R(Q,C)*(U*COS(HHH)-
S*T*V*SIN(HHH))
200 Y(J)=UDY+Y(JP)+R(Q,C)*(V*COS(HHH)+
S*T*U*SIN(HHH))
210 Z(J)=UDZ+Z(JP)+R(Q,C)*W*COS(HHH):G
OSUB 220
215 NEXT C:H3=1:NEXT P:NEXT JG:NEXT Q:
GOTO 2310
219 REM ****DIVERGENCE
220 IF (DIVFLG=0) OR (C=0) THEN 245
225 OLDIV=OLDIV+DIV
232 DEG :PH=180:DX=X(J)-X(JP):DY=Y(J)-
Y(JP):R=(DX*DX+DY*DY)^0.5
234 IF DX=0 THEN PHI=PH/2+(SGN(DY)<>1)
*PH:GOTO 240
236 PHI=ATN(DY/DX):IF SGN(DX)=1 THEN P
HI=2*PH*(SGN(DY)=-1)+PHI:GOTO 240
238 PHI=PH+PHI
240 X(J)=X(JP)+R*COS(OLDIV+PHI):Y(J)=Y
(JP)+R*SIN(OLDIV+PHI):DIVFLG=0
241 REM ****CONTROLLERS
245 IF MM=0 THEN 280
246 FOR M=1 TO MM:QX=QX(M)-X(J):QY=QY(
M)-Y(J):QZ=QZ(M)-Z(J):FX=FACTOR(M)
247 LK=(QX*QX+QY*QY+QZ*QZ)^0.5:X(J)=FX
*(QX/LK)+X(J):Y(J)=FX*(QY/LK)+Y(J):Z(J
)=FX*(QZ/LK)+Z(J)
248 NEXT M
280 RETURN
300 REM ***** VERTICAL BRANCH *****
302 LN(J,0)=JP:LN(J,1)=J:LN(J,2)=WID
305 HHH=H(Q,C):IF (C<>1) OR (DIV=0) TH
EN 310
306 HHH=HHH*H4:IF H3=0 THEN HHH=ABS(HH
H)
310 Y(J)=UDY+Y(JP)+R(Q,C)*T*SIN(HHH):X
(J)=UDX+X(JP):Z(J)=UDZ+Z(JP)+R(Q,C)*W*
COS(HHH)
320 GOSUB 220:RETURN
400 REM *** EXCHANGE VALUES
401 TT=H2:H2=H1:H1=TT:TT=DL:DL=DR:DR=T
T:RETURN
2270 REM **********************
2280 REM *    CHAIN WRITE     *
2290 REM **********************
2310 F$=DRIVE$:F$(LEN(F$)+1)=FILE$:CLO
SE #1:F1$=F$:F1$(LEN(F$)+1)=".PNT":OPE
N #1,8,0,F1$
2320 ? #1;P5
2330 FOR X=1 TO P5:? #1;X(X):NEXT X
2340 FOR X=1 TO P5:? #1;Y(X):NEXT X
2350 FOR X=1 TO P5:? #1;Z(X):NEXT X
2360 CLOSE #1:TRAP 1210:F1$=F$:F1$(LEN
(F$)+1)=".LIN":OPEN #1,8,0,F1$:TRAP 11
90
2370 ? #1;L5:FOR X=1 TO L5:? #1;LN(X,0
):? #1;LN(X,1):? #1;LN(X,2):NEXT X
2380 GRAPHICS 0:IF AUTFLG THEN RETURN
2390 STOP
3000 ? "MATRICES DIMENSIONED TOO SMALL
.":? "RERUN PROGRAMME-WAIT":FOR J=1 TO
 500:NEXT J:STOP
19995 REM **********************
19996 REM * YOUR TREE-MAKING   *
19997 REM *  PROGRAMME GOES    *
19998 REM *       HERE         *
19999 REM **********************
20000 AUTFLG=1
```

•

CHECKSUM DATA.

(see page 12)

```
1 DATA 58,613,730,516,66,597,819,712,3
0,619,331,389,286,790,429,6985
49 DATA 392,857,15,673,51,689,57,528,6
93,284,876,477,814,588,83,7077
124 DATA 794,495,441,162,637,785,666,3
68,214,320,307,422,792,768,161,7332
215 DATA 412,165,256,997,827,234,96,96
5,97,94,498,630,883,758,607,7519
300 DATA 113,655,277,406,6,974,689,554
,293,645,295,286,527,492,495,6707
2350 DATA 498,948,544,996,599,123,188,
36,874,108,200,896,6010
```

•

Listing 2.

```
20001 GOTO 22000
20002 REM ****DATA LOGGING****
20010 CLOSE #1:OPEN #1,8,0,"P:"
20015 ? #1:? #1:? #1;"        ";FILE$
20020 ? #1,"NUMBER OF LEVELS",L
20030 ? #1;" INITIAL WIDTH",WID
20040 ? #1;"CONTRACTION RATIO",DIAM
20050 ? #1;"LEFT ANGLE ",H1
20060 ? #1;"INCREMENT LEFT",DL
20070 ? #1;"RIGHT ANGLE",H2
20080 ? #1;"INCREMENT RIGHT",DR
20090 ? #1;"LEFT SHORTENING RATIO",R1
20100 ? #1;"LEFT S. RATIO INCREMENT",R
D1
20110 ? #1;"RIGHT SHORTENING RATIO",R2
20120 ? #1;"RIGHT  S. RATIO INCREMENT"
,RD2
20130 ? #1;"DIVERGENCE",DIV
20140 ? #1;"NO. CONTROLLERS",MM
20170 ? #1;"STRENGTH","X","Y","Z"
20180 FOR M=1 TO MM:? #1;FACTOR(M),QX(
M),QY(M),QZ(M):NEXT M
20190 ? #1,"UNIFORM DEVIATIONS"," ",UD
X,UDY,UDZ
20195 ? #1;CHR$(12)
20210 RETURN
20999 REM ***DATA READER ROUTINE ****
21000 READ L,WID,DIAM,H1,H2,DL,DR,R1,R
2,RD1,RD2,DIV,UDX,UDY,UDZ,MM:IF MM=0 T
HEN RETURN
21010 FOR J=1 TO MM:READ FF,X,Y,Z:QX(J
)=X:QY(J)=Y:QZ(J)=Z:FACTOR(J)=FF
21020 RETURN
21999 REM ****MAIN PROG****
22000 DIM FACTOR(10),QX(10),QY(10),QZ(
10):DRIVE$="D1:"
22005 FOR JK=0 TO 9
22010 FILE$="NO":FILE$(LEN(FILE$)+1)=S
TR$(JK):RESTORE 23000+JK:GOSUB 21000:G
OSUB 20010:GOSUB GO:GOSUB WRITE
```

```
22020 NEXT JK
23000 DATA 7,6,.7,30,35,0,0,.7,.9,0,0,
0,0,0,0,0
23001 DATA 7,6,.7,0,25,0,0,.7,.9,0,0,1
40,0,0,0,0
23002 DATA 7,6,.7,10,35,0,0,.7,.9,0,0,
140,0,0,0,0
23003 DATA 7,6,.7,20,25,2,2,.7,.9,0,0,
0,0,0,0,0
23004 DATA 7,6,.7,60,65,0,0,.5,.9,0,0,
0,0,0,0,0
23005 DATA 7,6,.7,30,35,0,0,.7,.9,0,0,
0,0,0,-.1,0
23006 DATA 7,6,.7,0,25,0,0,.7,.9,0,0,1
40,0,0,0,1,.07,1,1,1
23007 DATA 7,6,.7,30,35,0,0,.7,.9,0,0,
  0,0,0,.10,0
23008 DATA 7,6,.7,10,35,0,0,.7,.9,0,0,
0,0,.2,0,1,.05,0,1,1
23009 DATA 7,6,.7,0,25,0,0,.7,.9,0,0,0
,0,0,0,1,-.07,1,1,1
```

•

CHECKSUM DATA.

(see page 12)

```
20001 DATA 187,747,902,879,114,260,690
,274,958,518,219,977,243,962,508,8438
20130 DATA 507,237,24,113,30,447,46,98
7,376,286,49,376,545,719,746,5488
22020 DATA 978,790,16,259,801,812,259,
129,245,112,877,5278
```

•

Listing 3.

```
5 REM ****************************
10 REM *        PERSPEC           *
20 REM *  AUTOMATIC 3-D PLOT      *
30 REM *       PROGRAMME          *
40 REM ****************************
70 REM
80 GOTO 20000
440 REM ########################################
441 REM #           BEGIN                      #
442 REM ########################################
450 X(0)=VX:Y(0)=VY:Z(0)=VZ:D0=1
490 DX=VX-OX:DY=VY-OY:DZ=VZ-OZ
495 POKE 559,0
500 U1=SQR(DX*DX+DY*DY+DZ*DZ):IF U1=0
THEN U1=1E-06
510 CX=DX/U1:CY=DY/U1:CZ=DZ/U1
520 S3=SQR(1-CZ*CZ):S2=SQR(1-CY*CY)
530 QX=OX+D0*CX:QY=OY+D0*CY:QZ=OZ+D0*C
Z
540 XW=X(0):YW=Y(0):ZW=Z(0):GOSUB 610
541 FOR I=1 TO P5:XW=X(I)*SCL+XS:YW=Y(
I)*SCL+YS:ZW=Z(I)*SCL+ZS:GOSUB 610:NEX
T I
549 I=0:IF VIS(I)<>0 THEN XW=X(0):YW=Y
(0):ZW=Z(0):GOSUB 610:GOSUB 670
550 FOR I=1 TO P5:IF VIS(I)=0 THEN 570
560 XW=X(I)*SCL+XS:YW=Y(I)*SCL+YS:ZW=Z
(I)*SCL+ZS:GOSUB 610:GOSUB 670
570 NEXT I:GOTO 740
580 REM ****************************
590 REM *  IS THE POINT VISIBLE?  *
600 REM ****************************
610 VIS(I)=1:VCX=XW-OX:VCY=YW-OY:VCZ=Z
W-OZ
```




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CIRCLE #113 ON READER SERVICE CARD

```
620 IF DX*VCX+DY*VCY+DZ*VCZ)0 THEN RET
URN
630 VIS(I)=0:RETURN
640 REM ****************************
650 REM *  NOW CALC PLOT COORDS   *
660 REM ****************************
670 K=D0/(VCX*CX+VCY*CY+VCZ*CZ)
680 AX=OX+K*VCX:AY=OY+K*VCY:AZ=OZ+K*VC
Z
690 IF S3=0 THEN 720
700 P(I,1)=((AX-QX)*CY-(AY-QY)*CX)/S3
710 P(I,2)=(AZ-QZ)/S3:RETURN
720 P(I,1)=((QX-AX)*CZ+(AZ-QZ)*CX)/S2
730 P(I,2)=(AY-QY)/S2:RETURN
740 REM ****************************
750 REM *     SCALE THE IMAGE     *
760 REM ****************************
770 T=450*ZOOM:FOR I=0 TO PS
780 P(I,1)=P(I,1)*T
790 P(I,2)=P(I,2)*T
800 NEXT I
810 XAD=160-P(0,1):YAD=96-P(0,2):FOR I
=1 TO PS:P(I,1)=P(I,1)+XAD:P(I,2)=P(I,
2)+YAD:NEXT I
820 REM ****************************
830 REM *   NOW DRAW THE IMAGE!   *
840 REM ****************************
845 SETCOLOR 2,0,0:COLOR 1:TRAP OFF:GR
APHICS 56
870 FOR I=1 TO LS:TV=VIS(LN(I,0))+VIS(
LN(I,1)):IF TV=0 THEN 1010
880 IF TV=2 THEN 980
890 QT=0:ISAVE=I:IF VIS(LN(I,0))=0 THE
N I1=LN(I,0):I2=LN(I,1):I=LN(I,0):GOTO
 910
900 I1=LN(I,1):I2=LN(I,0):I=LN(I,1)
910 XT1=X(I1)*SCL+XS:YT1=Y(I1)*SCL+YS:
ZT1=Z(I1)*SCL+ZS
911 XT2=X(I2)*SCL+XS:YT2=Y(I2)*SCL+YS:
ZT2=Z(I2)*SCL+ZS:FV=0:FH=0
920 XW=(XT1+XT2)/2:YW=(YT1+YT2)/2:ZW=(
ZT1+ZT2)/2:GOSUB 610
930 IF VIS(I)>0 THEN XT2=XW:YT2=YW:ZT2
=ZW:GOTO 950
940 XT1=XW:YT1=YW:ZT1=ZW
950 QT=QT+1:IF QT<15 THEN 920
960 XW=XT2:YW=YT2:ZW=ZT2:GOSUB 610
970 GOSUB 670:P(I,1)=P(I,1)*T+XAD:P(I,
2)=P(I,2)*T+YAD:VIS(I)=0:I=ISAVE
980 X1=P(LN(I,0),1):Y1=191-P(LN(I,0),2
):X2=P(LN(I,1),1):Y2=191-P(LN(I,1),2)
981 W=LN(I,2):XC=X1:YC=Y1:X=X2:Y=Y2
982 KK=((X(I1)+X(I2))/2+XS-OX)^2+((Y(I
1)+Y(I2))/2+YS-OY)^2+((Z(I1)+Z(I2))/2+
ZS-OZ)^2
983 W=6*W*KK^-0.5:GOSUB 3000
1010 NEXT I
1011 IF O$="Y" THEN ? #3;"H"
1030 FOR X=15 TO 0 STEP -1:SOUND 0,120
,10,X:NEXT X
1040 RETURN
1190 ? :? "I/O ERROR - ";PEEK(195):GO
TO 1210
1210 ? :? "PRESS RETURN":INPUT IN$:STO
P
1550 REM ****************************
1560 REM *  GRAPHICS CLIP ROUTINE  *
1570 REM ****************************
1580 L1=0:L2=0:R1=0:G(10)=0:T1=0:T2=0:
G(9)=0:G(8)=0:POK=0
1590 IF X1<G(7) THEN L1=1:GOTO 1610
1600 IF X1>G(6) THEN R1=1
1610 IF Y1>G(5) THEN G(9)=1:GOTO 1630
1620 IF Y1<YT THEN T1=1
1630 IF X2<G(7) THEN L2=1:GOTO 1650
1640 IF X2>G(6) THEN G(10)=1
1650 IF Y2>G(5) THEN G(8)=1:GOTO 1670
1660 IF Y2<YT THEN T2=1
1670 IF L1+L2=2 OR R1+G(10)=2 OR T1+T2
=2 OR G(9)+G(8)=2 THEN RETURN
1680 G(4)=X1:G(3)=Y1:G(2)=X2:G(1)=Y2:G
OSUB 1730
1690 L1=L2:R1=G(10):T1=T2:G(9)=G(8)
1700 X1=XW:Y1=YW:G(4)=X2:G(3)=Y2:G(2)=
X1:G(1)=Y1:GOSUB 1730
1710 IF X1<G(7) OR X1>G(6) OR Y1<YT OR
 Y1>G(5) OR XW<G(7) OR XW>G(6) OR YW<Y
T OR YW>G(5) THEN RETURN
1720 PLOT X1,SCY*Y1:DRAWTO XW,SCY*YW:P
OK=1:RETURN
1730 IF L1+T1+G(9)+R1=0 THEN XW=G(4):Y
W=G(3):RETURN
1740 IF L1 THEN XW=G(7):YW=G(3)+(G(1)-
G(3))*(G(7)-G(4))/(G(2)-G(4)):G(4)=XW:
G(3)=YW
1742 IF L1 AND G(3)>=YT AND G(3)<=G(5)
 THEN RETURN
1750 IF R1 THEN XW=G(6):YW=G(3)+(G(1)-
G(3))*(G(6)-G(4))/(G(2)-G(4)):G(4)=XW:
G(3)=YW
1752 IF R1 AND G(3)>=YT AND G(3)<=G(5)
 THEN RETURN
1760 IF G(9) THEN YW=G(5):XW=G(4)+(G(2
)-G(4))*(G(5)-G(3))/(G(1)-G(3)):G(4)=X
W:G(3)=YW
1762 IF G(9) AND G(4)>=G(6) AND G(4)<=
G(7) THEN RETURN
1770 IF T1 THEN YW=YT:XW=G(4)+(G(2)-G(
4))*(YT-G(3))/(G(1)-G(3)):G(4)=XW:G(3)
=YW
1780 RETURN
2000 REM ************************
2010 REM *      GET FILE        *
2020 REM ************************
2025 F$=DRIVE$:F$(LEN(F$)+1)=FILE$:FF$
=F$
2060 F$(LEN(F$)+1)=".PNT":CLOSE #1:OPE
N #1,4,0,F$:INPUT #1;PS
2080 TRAP 2100:DIM X(PS),Y(PS),Z(PS),P
(PS,2),VIS(PS)
2100 FOR X=1 TO PS:INPUT #1,Q1:X(X)=Q1
:NEXT X
2110 FOR X=1 TO PS:INPUT #1,Q1:Y(X)=Q1
:NEXT X
2120 FOR X=1 TO PS:INPUT #1,Q1:Z(X)=Q1
:NEXT X:CLOSE #1
2170 F$=FF$:F$(LEN(F$)+1)=".LIN":CLOSE
 #1:OPEN #1,4,0,F$:INPUT #1;LS
2190 TRAP 2210:DIM LN(LS,2)
2210 FOR X=1 TO LS:INPUT #1,Q1:LN(X,0)
=Q1:INPUT #1,Q1:LN(X,1)=Q1:INPUT #1,Q1
:LN(X,2)=Q1:NEXT X
2240 CLOSE #1:TRAP OFF:RETURN
2250 ? :? "CAN'T OPEN FILE!":GOTO 121
0
2260 ? :? "FILE FORMAT ERROR - ";PEEK
(195):GOTO 1210
2700 REM ************************
2701 REM *       ROTATE         *
2702 REM ************************
2705 POKE 559,0:XC=0:YC=0
2720 FOR J=1 TO PS:X=X(J):Y=Y(J):GOSUB
 3100
2740 X(J)=XC+R*COS(THETA+PHI)
2750 Y(J)=YC+R*SIN(THETA+PHI)
2760 NEXT J
2770 RETURN
2996 REM ************************
2997 REM *        WIDE          *
2999 REM ************************
3000 IF (X=XC) AND (Y=YC) THEN RETURN
3010 GOSUB 3070
3040 IF ABS(X50)>ABS(Y50) THEN X50=-SI
N(PHI)/COS(PHI):Y50=1:GOTO 3060
```

```
3050 Y50=COS(PHI)/SIN(PHI):X50=-1
3051 IF (W<0.4) OR (SD$="N") THEN GOSU
B 1550:FOR J=1 TO 1:GOTO 3061
3060 FOR J=-W/2 TO W/2 STEP 0.4:X1=XC+
J*X50:Y1=YC+J*Y50:X2=XC+J*X50+R*COS(PH
I):Y2=YC+J*Y50+R*SIN(PHI):GOSUB 1550
3061 IF O$="N" OR POK=0 THEN NEXT J:RE
TURN
3062 IF SD$="Y" THEN 3064
3063 ? #3;"M";X1*1.5;",";(191-Y1)*1.5;
"*D";XW*1.5;",";(191-YW)*1.5:PC=PC+1:R
ETURN
3064 ? #3;"M";2.5*(191-Y1);",";-2.5*X1
;"*D";2.5*(191-YW);",";-2.5*XW:PC=PC+1
3065 NEXT J:RETURN
3070 REM ************************
3080 REM *        ATAN          *
3090 REM ************************
3100 DEG :X50=X-XC:Y50=Y-YC:R=(X50*X50
+Y50*Y50)^0.5:PH=180
3110 IF X50=0 THEN PHI=PH/2+(SGN(Y50)<
>1)*PH:RETURN
3120 PHI=ATN(Y50/X50):IF SGN(X50)=1 TH
EN PHI=2*PH*(SGN(Y50)=-1)+PHI:RETURN
3130 PHI=PH+PHI:RETURN
3200 REM ************************
3201 REM *    PLOTTER CONTROL    *
3202 REM ************************
3210 O$="Y"
3220 CLOSE #3:OPEN #3,8,0,"P:":? #3;EG
$:PC=0
3240 RETURN
3245 O$="N":CLOSE #3:RETURN
3250 ? #3;"C1":RETURN
3251 ? #3;"C2":RETURN
3253 ? #3;"C3":RETURN
3254 ? #3;"C0":RETURN
3260 IF O$<>"Y" THEN RETURN
3261 IF SD$="Y" THEN ? #3;"H*M0,-900*I
":RETURN
3262 ? #3;"H*M0,-480*I":RETURN
3271 IF O$="Y" AND SD$="Y" THEN ? #3;"
M0,0*D480,0*D480,-800*D0,-800*D0,0":RE
TURN
3280 IF O$="Y" THEN ? #3;"M0,0*D480,0*
D480,288*D0,288*D0,0"
3290 RETURN
4000 REM ******EPSON DUMP*********
4010 SCREEN=PEEK(88)+PEEK(89)*256:TRAP
 4040:CLOSE #1:OPEN #1,8,0,"P:":? #1;"
E&A";CHR$(8)
4020 FOR I=SCREEN TO SCREEN+39:? #1;"E
K";CHR$(192);CHR$(0);
4030 FOR J=I+7640 TO I STEP -40:PUT #1
,PEEK(J):NEXT J:? #1:NEXT I:CLOSE #1
4035 STOP
4040 RETURN
5000 F$=DRIVE$:F$(LEN(F$)+1)=FILE$:FF$
=F$
5010 CLOSE #1:OPEN #1,4,0,F$:INPUT #1;
PS
5020 TRAP 5030:DIM X(PS),Y(PS),Z(PS),P
(PS,2),VIS(PS)
5030 FOR X=1 TO PS:INPUT #1,Q1:X(X)=Q1
:NEXT X
5040 FOR X=1 TO PS:INPUT #1,Q1:Y(X)=Q1
:NEXT X
5050 FOR X=1 TO PS:INPUT #1,Q1:Z(X)=Q1
:NEXT X:CLOSE #1
5060 INPUT #1;LS
5070 TRAP 5080:DIM LN(LS,2)
5080 FOR X=1 TO LS:INPUT #1,Q1:LN(X,0)
=Q1:INPUT #1,Q1:LN(X,1)=Q1:LN(X,2)=WID
TH:NEXT X
5090 CLOSE #1:TRAP OFF:RETURN
5100 SD$="Y":GOSUB PLOTON:RETURN
5200 SD$="N":GOSUB PLOTON:RETURN
```

```
20000 SCY=11/13:DIM O$(1),EG$(2),SD$(1
),G(10):EG$=CHR$(27):EG$(2)=CHR$(7)
20010 DIM DRIVE$(3),FILE$(8),FF$(20),F
$(20),IN$(1),F1$(20)
20020 G(7)=0:G(6)=319:YT=0:G(5)=191:OF
F=40000
20030 LET GETFILE=2025:LET GO=450:ROTA
TE=2705:LET PLOTON=3210:DUMP=4010:BIG=
5100:SMALL=5200:LET PLOTOFF=3245
20031 OLDFILE=5000:RED=3253:BLUE=3250:
GREEN=3251:BLACK=3254:PAGE=3260:FRAME=
3271
29995 REM ************************
29996 REM *    YOUR DISPLAY      *
29997 REM *   PROGRAMME GOES     *
29998 REM *        HERE          *
29999 REM ************************
```

●

CHECKSUM DATA.

(see page 12)

```
5 DATA 250,243,942,410,89,263,904,187,
482,189,119,463,809,470,216,6036
520 DATA 489,389,63,13,815,871,225,868
,374,466,352,181,844,719,364,7033
650 DATA 318,370,435,571,501,848,937,8
54,936,366,889,372,935,581,587,9500
800 DATA 742,548,362,193,368,254,258,5
60,857,273,263,680,727,815,679,7579
950 DATA 764,109,918,763,710,55,821,48
5,287,217,783,269,956,563,746,8446
1570 DATA 565,763,184,262,676,833,194,
487,685,840,902,608,32,216,742,7989
1720 DATA 990,575,213,323,217,330,780,
610,435,808,96,224,98,779,286,6764
2080 DATA 31,953,957,48,999,365,174,79
,748,533,301,451,305,389,809,7142
2740 DATA 902,916,516,809,328,212,334,
714,948,943,384,25,438,758,223,8450
3063 DATA 270,292,888,289,237,291,785,
762,651,207,540,352,544,296,102,6506
3240 DATA 793,795,803,807,813,809,839,
534,797,11,177,798,209,186,93,8464
4030 DATA 115,598,789,773,984,45,959,9
63,54,331,387,247,84,641,611,7581
20000 DATA 283,512,266,8,971,190,774,9
37,177,202,4320
```

●

Listing 4.
BASIC listing.

```
30000 ? "DRIVE?-IN THE FORM 'D1:' ":IN
PUT DRIVE$:? :? "FILENAME?":INPUT FILE
$:TRAP 30010:DIM S$(6)
30010 ? "BIG OR SMALL PICTURE,OR SCREE
N ONLY?":INPUT S$
30020 IF S$="BIG" THEN GOSUB BIG:GOTO
30050
30025 IF S$="SCREEN" THEN GOSUB PLOTOF
F:GOTO 30085
30030 IF S$="SMALL" THEN GOSUB SMALL:G
OTO 30050
30040 ? "INVALID INPUT-TRY AGAIN":GOTO
 30010
30050 ? "COLOUR?--BLACK=1":? :? "
    BLUE=2":? :? "          GREEN=3":?
:? "          RED=4":INPUT C
```

```
30060 COLOUR=(BLACK*(C=1))+(BLUE*(C=2)
)+(GREEN*(C=3))+(RED*(C=4))
30080 GOSUB PAGE:GOSUB COLOUR:GOSUB FR
AME
30085 SCL=1:ZOOM=1:OX=0:OY=10:OZ=0:VX=
0:VY=0:VZ=2.5:XS=0:YS=0:ZS=0
30090 GRAPHICS 24:TRAP 30100:GOSUB GET
FILE:GOSUB GO:STOP
30100 ? "NO SUCH FILE":GOTO 30000
```

●

CHECKSUM DATA.

(see page 12)

```
30000 DATA 200,149,509,474,11,721,970,
632,808,975,767,154,6370
```

●

Listing 5.
BASIC listing.

```
30000 SCL=1:ZOOM=1:OX=0:OY=20:OZ=0:VX=
0:VY=0:VZ=2
30006 GRAPHICS 24:GOSUB BIG:GOSUB BLAC
K:GOSUB FRAME
30010 DRIVE$="D1:"
30020 FOR JKK=1 TO 7:FILE$="NO":FILE$(
3)=STR$(JKK):XS=-5+10*RND(0):YS=-5+10*
RND(0):ZS=0:GOSUB GETFILE:GOSUB GO
30030 NEXT JKK
```

●

CHECKSUM DATA.

(see page 12)

```
30000 DATA 878,129,346,891,891,3135
```

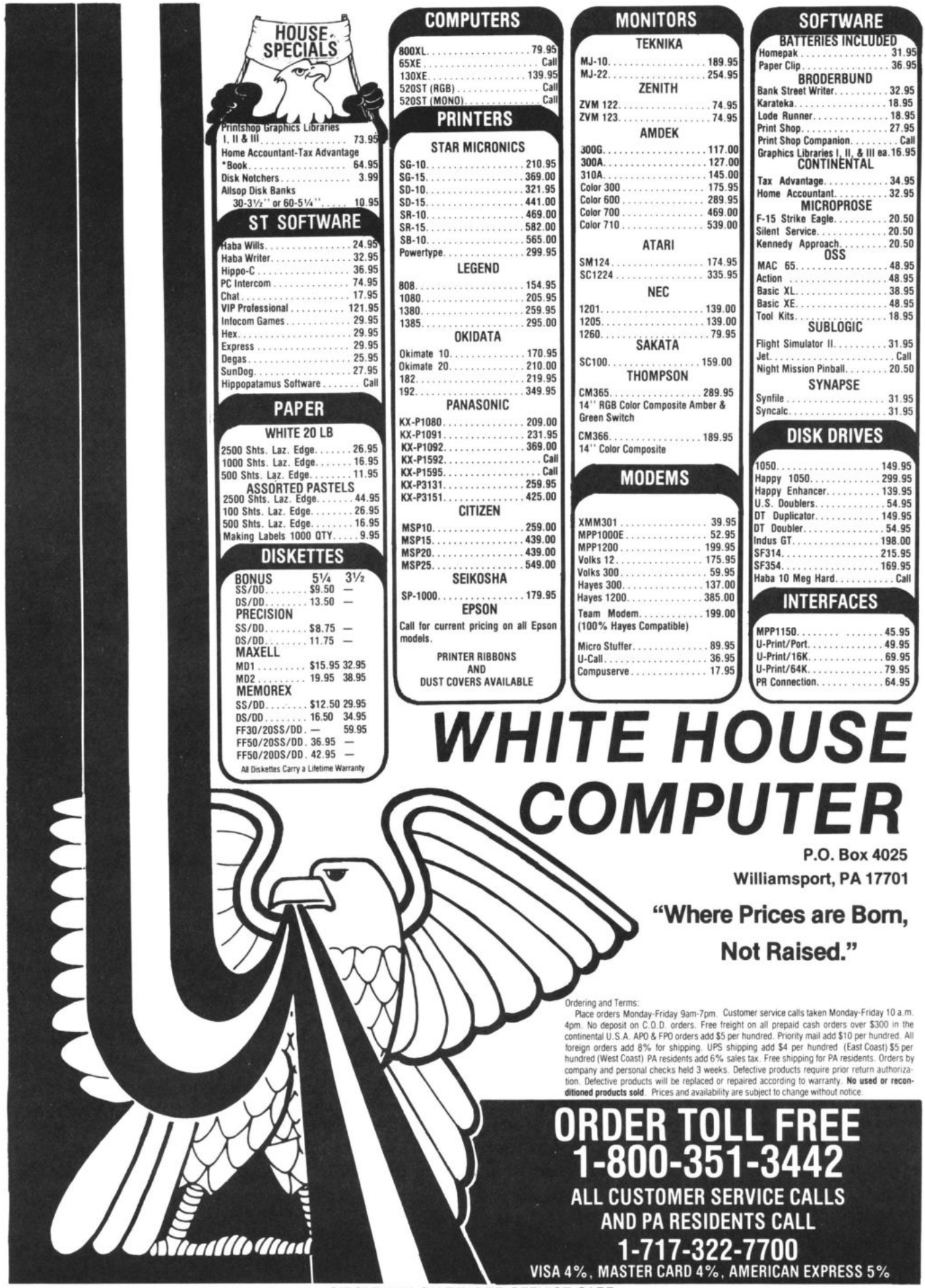
●

Attention Programmers!

ANALOG Computing is interested in programs, articles, and software review submissions dealing with the Atari home computers. If you feel that you can write as well as you can program, then submit those articles and reviews that have been floating around in your head, awaiting publication. This is your opportunity to share your knowledge with the growing family of Atari computer owners.

All submissions for publication, both program listings and text, should be provided in printed and magnetic form. Typed or printed copy of text is mandatory and should be in upper and lower case with double spacing. By submitting articles to **ANALOG Computing**, authors acknowledge that such materials, upon acceptance for publication, become the exclusive property of **ANALOG Computing**. If not accepted for publication, the articles and/or programs will remain the property of the author. If submissions are to be returned, please supply a self-addressed, stamped envelope. All submissions of any kind must be accompanied by the author's full address and telephone number.

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CIRCLE #114 ON READER SERVICE CARD



M/L Editor

Makes machine language entry a snap.

by Clayton Walnum

M/L Editor provides an easy, foolproof method for the entry of **ANALOG Computing**'s machine language listings. Since machine language files are extremely fussy creatures, **M/L Editor** keeps a constant guard on your fumbling fingers. It won't allow you to skip lines or enter bad data.

For your convenience, you may enter listings in multiple sittings (this gives you a chance to soak your calluses), continuing them at your leisure. When you're through typing a listing with the **M/L Editor**, you'll have a complete, runnable object file on your disk. No more slow BASIC file creators.

There is, however, one hitch. **M/L Editor** is for disk users only. My apologies to those readers with cassette systems.

Typing it in.

Listing 1 is the BASIC listing for **M/L Editor**. Type it in, then validate your work with **Unicheck** (see page 12). When you're sure the program is free of typos, save a copy to disk, then run it.

Getting started.

When you first run the program, 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 the program to be saved 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. The program will then check the disk. If it 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.

Entering data.

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 make your way 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 containing 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 checksum for your entries with the checksum from the magazine. 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 rude buzzing sound. The screen will turn red, and the cursor will be placed back at the first byte of data. Check through the magazine listing byte by byte and compare it with your entries. If a number is correct, just press RETURN.

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

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

Ending a session.

You may stop for a rest 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 manner.

Running M/L Editor files.

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 using the L option. Some programs may have special loading instructions. Be sure to check the program's article for special cases.

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.

Listing 1.
BASIC listing.

```
10 DIM BF(16),N$(4),A$(1),B$(1),F$(15)
,F1$(15)
20 LINE=1000:RETRN=155:BACKSP=126:CHKS
UM=0:EDIT=0
30 GOSUB 450:POSITION 10,6:? "Start or
 Continue? ";:GOSUB 500:? CHR$(A)
40 POSITION 10,8:? "FILENAME";:INPUT F
$:POKE 752,1:? " "
50 IF LEN(F$)<3 THEN POSITION 20,10:?
"  ":GOTO 40
60 IF F$(1,2)<>"D:" THEN F1$="D:":F1$(
3)=F$:GOTO 80
70 F1$=F$
80 IF CHR$(A)="S" THEN 120
90 TRAP 430:OPEN #2,4,0,F1$:TRAP 110
100 FOR X=1 TO 16:GET #2,A:NEXT X:LINE
=LINE+10:GOTO 100
110 CLOSE #2:OPEN #2,9,0,F1$:GOTO 170
120 TRAP 160:OPEN #2,4,0,F1$:GOSUB 440
:POSITION 10,10:? "FILE ALREADY EXISTS
!!":POKE 752,0
130 POSITION 10,12:? "ERASE IT? ";:GOS
UB 500:POKE 752,1:? CHR$(A)
140 IF CHR$(A)="N" OR CHR$(A)="n" THEN
 CLOSE #2:GOTO 30
150 IF CHR$(A)<>"Y" AND CHR$(A)<>"y" T
HEN 130
160 CLOSE #2:OPEN #2,8,0,F1$
170 GOSUB 450:POSITION 10,1:? "NOW ON
LINE: ";LINE:CHKSUM=0
180 L1=3:FOR X=1 TO 16:POSITION 13*(X<
10)+12*(X>9),X+2:POKE 752,0:? "BYTE #"
;X;": ";:GOSUB 310
190 IF EDIT AND L=0 THEN BYTE=BF(X):GO
TO 210
200 BYTE=VAL(N$)
210 POSITION 22,X+2:? BYTE;"  "
220 BF(X)=BYTE:CHKSUM=CHKSUM+BYTE*X:IF
 CHKSUM>9999 THEN CHKSUM=CHKSUM-10000
230 NEXT X:CHKSUM=CHKSUM+LINE:IF CHKSU
M>9999 THEN CHKSUM=CHKSUM-10000
240 POSITION 12,X+2:POKE 752,0:? "CHEC
KSUM: ";:L1=4:GOSUB 310
250 IF EDIT AND L=0 THEN 270
260 C=VAL(N$)
270 POSITION 22,X+2:? C;"   "
280 IF C=CHKSUM THEN 300
290 GOSUB 440:EDIT=1:CHKSUM=0:GOTO 180
300 FOR X=1 TO 16:PUT #2,BF(X):NEXT X:
LINE=LINE+10:EDIT=0:GOTO 170
310 L=0
320 GOSUB 500:IF A=ASC("Q") AND X=1 AN
D  NOT EDIT THEN 420
330 IF A<>RETRN AND A<>BACKSP AND (A<4
8 OR A>57) THEN 320
335 IF A=RETRN AND L=0 AND X>1 THEN 35
0
340 IF ((A=RETRN AND  NOT EDIT) OR A=B
ACKSP) AND L=0 THEN 320
350 IF A=RETRN THEN POKE 752,1:? " ":R
ETURN
360 IF A<>BACKSP THEN 400
370 IF L>1 THEN N$=N$(1,L-1):GOTO 390
380 N$=""
390 ? CHR$(BACKSP);:L=L-1:GOTO 320
400 L=L+1:IF L>L1 THEN A=RETRN:GOTO 35
0
410 N$(L)=CHR$(A):? CHR$(A);:GOTO 320
420 GRAPHICS 0:END
430 GOSUB 440:POSITION 10,10:? "NO SUC
H FILE!":FOR X=1 TO 1000:NEXT X:CLOSE
#2:GOTO 30
440 POKE 710,48:SOUND 0,100,12,8:FOR X
=1 TO 50:NEXT X:SOUND 0,0,0,0:RETURN
450 GRAPHICS 23:POKE 16,112:POKE 53774
,112:POKE 559,0:POKE 710,4
460 DL=PEEK(560)+256*PEEK(561)+4:POKE
DL-1,70:POKE DL+2,6
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
480 POKE DL+41,65:POKE DL+42,PEEK(560)
:POKE DL+43,PEEK(561):POKE 87,0
490 POSITION 2,0:? "analog ml editor":
POKE 559,34:RETURN
500 OPEN #1,4,0,"K:":GET #1,A:CLOSE #1
:RETURN
```

CHECKSUM DATA.

(see page 12)

```
10 DATA 844,818,581,931,199,876,287,11
7,473,99,704,154,808,977,435,8303
160 DATA 621,391,292,619,419,118,385,6
62,900,749,976,463,314,963,673,8545
310 DATA 211,144,187,122,650,545,411,7
13,220,572,232,711,768,635,394,6515
450 DATA 25,972,926,303,454,760,3440
```

D&D Character Generator II

Part 2.

by Bob Curtin

I trust you've all gotten last month's **D&D Character Generator II** up and running. Excellent. Here's part 2.

Aside from generating the character proper, the most arduous task facing the Dungeon Master in character generation is overseeing the outfitting of the upstart delver. It's often necessary to check equipment lists for "creative" buying or inept arithmetic or even outright shoplifting. (No! The deuce, you say!)

No more. This program allows the player to browse through lists of equipment, armor, weapons, livestock, clothing, provisions, religious items and camping gear, then, at the touch of a button, purchase those items desired. The gold pieces generated in our last month's program are brought forward and used by the player to outfit his character.

As each item is purchased, the correct amount of "money" is deducted from the character's total. Note that change is made automatically. That is, if an item costs only a copper piece, the computer will (if no copper pieces are available) take the next highest coin, change it into copper pieces and deduct the correct amount from the total.

Once an item is purchased, it may not be returned, although there's nothing to stop the player from selling it back to the store after the game starts. For this reason, I included the "browse" feature. You can call up and read any menu desired—without buying anything.

Essentially, I designed **DCG2** to be used without supervision by a Dungeon Master. The time can be used by the DM to prepare other players to generate their characters (or any such detail work), leaving the player alone to outfit his character as he sees fit.

Again, I advise keeping reference material handy to the player, to explain what some of the more exotic weapons are. (Do *you* know what a Khopesh sword looks like?) This preparation will pay off in the long run.

The program is simple and straightforward to use. When the main menu appears, press the category of items you want to look at. A list of items will appear, along with the price of each. To return to the main menu, press the ESCAPE key.

To "buy" an item, once in a particular category, simply press the letter corresponding to the item you want. Once an item is chosen, the category heading is printed on the character sheet and the item itself is stored.

After three items have been chosen, they will be printed under the heading. (I did this for no other reason than to keep the printout neat.) After all items have been chosen in a particular category, simply press ESCAPE, and you'll be returned to the main menu. Any items which had not yet been printed will be dumped to the printer.

At the top of the screen is a display showing the character's available money (in gold, silver and copper pieces) and the character's current encumbrance

level. As each item is purchased, this display is updated (money deducted, encumbrance added).

When all desired items have been purchased, return to the main menu and press Q. The character's remaining money will be printed on the sheet, along with the final encumbrance level.

Borrowing money.

If a player tries to buy an item which costs more than his available money, a bell will sound and he'll be informed of the oversight. At this point, said player will also be asked if he would like to add money. If the answer is yes (Y), the computer will ask for the password. The following procedure must be followed.

(1) Type the three-character code which has been assigned to CODE$ in Line 25 and press RETURN. You may change this code to anything you wish when you type in the program, or anytime afterward. I suggest changing it often.

(2) When *GOLD PIECES TO ADD?* appears, enter the amount of money, in gold pieces, that you're adding to the player's total and press RETURN.

If the correct code is not typed in, the money will not be added. Note that, by adding a negative amount to the player's total, you can also subtract gold from his stash.

I provided this lockout so that players couldn't add money while the DM's back was turned. Again, I wanted to make this program as self-sufficient as possible, to free up the DM for more creative chores.

Save this program on the same disk as DDC9.2 and use the filename D:EQUIPMNT. Also, remember to delete Line 1395 in the character generation program (DDC9.2).

For those who are interested, I'd like to point out a very powerful feature of Atari BASIC: the "restore" command. You're allowed to use expressions to point to line numbers when using the restore command. This brings up all sorts of interesting possibilities. You can randomly choose data elements, using combinations of RESTORE, READ and RND. Individual parts of the data can also be accessed, by loading the data into strings and using the usual SVAR(x,y) methods documented elsewhere.

Try to think of DATA as more than just something to be used to load tables or machine-language subroutines. With a little imagination and experimentation, it can be used for all kinds of interesting chores.

More D&D coming up!

Next month, look for the part 3—the Spell Generator. With that in place, your players can choose their spells (the computer never lets them have too many) and make their qualifying rolls automatically. It, too, has a browse feature, enabling the player to find out what's available before making any hard choices.

Bob Curtin is a machinist who got into computing in 1982 when he bought an Atari 800. He uses it for writing, programming and telecommunications. He prefers the more cerebral computer games.

Listing 1.
BASIC listing.

```
10 OPEN #1,4,0,"D:CHARACTR.DTA"
20 DIM AT(30,10),COST(80),A$(4),B$(40)
,C$(40),TEMP$(80),HEAD$(31),ENC(80),AB
$(31),LNAM$(165),NAM$(20),X$(3)
25 DIM CODE$(3):CODE$="QWE"
30 GOSUB 8500:GOTO 50
40 FOR E=1 TO LEN(HEAD$):AB$(E,E)=CHR$
(ASC(HEAD$(E,E))-128):NEXT E:RETURN
50 INPUT #1;CHAR:INPUT #1;NAM$:CLOSE #
1:OPEN #1,4,0,NAM$:FOR E=1 TO 30:FOR J
=1 TO CHAR
60 INPUT #1;A:AT(E,J)=A
70 NEXT J:NEXT E:INPUT #1;LNAM$:CLOSE
#1:N=AT(22,1)
80 IF LNAM$="" THEN LNAM$=" ":LNAM$(16
5)=LNAM$:LNAM$(2)=LNAM$
90 GP=AT(18,N):MONEY=GP*200:OPEN #2,8,
0,"P:":? #2;"
                                        "
100 X=1:Y=20:GOSUB 330:GOTO 340
110 GP=INT(MONEY/200):A=GP*200:B=INT(M
ONEY-A):SP=INT(B/10):A=SP*10:COP=B-A
120 POSITION 2,0
130 ? "
    "
135 ? "†GP=";GP;"  ";"SP=";SP;"  ";"CP
=";COP;"  ";"ENC=";INT(ENC+MONEY/2000)
:? :? :RETURN
140 REM
150 GRAPHICS 0:POKE 710,Z:POKE 709,0:P
OKE 752,1:GOSUB 8500
160 ? "GP=";GP;"  ";"SP=";SP;"  ";"CP=
";CP;"  ";"ENC=";INT(ENC+MONEY/2000):?
170 ? HEAD$
180 RESTORE LINE
190 FOR E=1 TO NI
200 READ A$,B$,C$,COST,EN:COST(E)=COST
:ENC(E)=EN
210 ? A$;" ";B$;C$
220 NEXT E
230 OPEN #1,4,0,"K:":GET #1,CMD:CLOSE
#1:IF CMD=27 THEN IF TEMP$(1,1)<>" " T
HEN ? #2;CHR$(15);TEMP$
240 IF CMD=27 THEN GOTO 320
250 IF CMD=42 THEN GOSUB 9000
260 IF CMD<65 OR CMD>NI+64 THEN 230
270 MONEY=MONEY-COST(CMD-64):IF MONEY<
0 THEN MONEY=MONEY+COST(CMD-64):GOSUB
610:GOTO 230
280 FLAG=FLAG+1:GOSUB 9000:ENC=ENC+ENC
(CMD-64):GOSUB 110
290 RESTORE LIN2+CMD:READ A$,B$:TEMP$(
X,Y)=B$:X=X+20:Y=Y+20:IF X>60 THEN ? #
2;CHR$(15);TEMP$:X=1:Y=20
300 IF X=1 THEN GOSUB 330
310 GOTO 230
320 RETURN
```

```
330 TEMP$=" ":TEMP$(80)=TEMP$:TEMP$(2)
=TEMP$:RETURN
340 GRAPHICS 0:POKE 752,1:POKE 710,120
:GOSUB 8500
350 TRAP 8000:POKE 709,0:POSITION 2,2:
GOSUB 10000:POSITION 2,4:? "          E
QUIPMENT MENU                "
360 ? "GP=";GP;"  ";"SP=";SP;"  ";"CP=
";COP;"  ";"ENC=";INT(ENC+MONEY/2000)
370 ? :? "A ARMOR":? "B BLADED WEAPONS
":? "C HAND WEAPONS":? "D MISSILE WEAP
ONS":? "E POLE ARMS"
380 ? "F MISCELLANEOUS EQUIPMENT"
390 ? "G TACK & CAMPING EQUIPMENT":? "
H RELIGIOUS ITEMS":? "I LIVESTOCK":? "
J PROVISIONS":? "K CLOTHING"
400 ? "L ADD MONEY";? "Q QUIT"
410 OPEN #1,4,0,"K:":GET #1,CMD:CLOSE
#1:IF CMD=81 THEN GOTO 12000
420 IF CMD<65 OR CMD>76 THEN 410
430 ON CMD-64 GOTO 450,590,460,470,600
,480,490,500,510,520,440,530
440 FLAG=0:Z=246:LIN2=2000:HEAD$="CLOT
HING                         ":NI=12:LI
NE=2065:GOSUB 330:GOSUB 140:GOTO 340
450 FLAG=0:Z=8:LIN2=2100:HEAD$="ARMOR
                             ":NI=18:LIN
E=2165:GOSUB 330:GOSUB 140:GOTO 340
460 FLAG=0:Z=200:LIN2=2900:HEAD$="HAND
 WEAPONS                     ":NI=15:L
INE=2965:GOSUB 330:GOSUB 140:GOTO 340
470 FLAG=0:Z=58:LIN2=2300:HEAD$="MISSI
LE WEAPONS                   ":NI=12:L
INE=2365:GOSUB 330:GOSUB 140:GOTO 340
480 FLAG=0:Z=24:LIN2=2400:HEAD$="MISCE
LLANEOUS EQUIPMENT           ":NI=17:L
INE=2465:GOSUB 330:GOSUB 140:GOTO 340
490 FLAG=0:Z=248:LIN2=2500:HEAD$="TACK
 & CAMPING EQUIPMENT         ":NI=15:
LINE=2565:GOSUB 330:GOSUB 140:GOTO 340
500 FLAG=0:Z=92:LIN2=2600:HEAD$="RELIG
IOUS ITEMS                   ":NI=10:
LINE=2665:GOSUB 330:GOSUB 140:GOTO 340
510 FLAG=0:Z=26:LIN2=2700:HEAD$="LIVES
TOCK                         ":NI=15:
LINE=2765:GOSUB 330:GOSUB 140:GOTO 340
520 FLAG=0:Z=184:LIN2=2800:HEAD$="PROV
ISIONS                       ":NI=9:
LINE=2865:GOSUB 330:GOSUB 140:GOTO 340
530 POSITION 2,22:? "PASSWORD";:INPUT
X$:IF X$=CODE$ THEN 560
540 ? "↑                              ":? "
↑WRONG PASSWORD!!":FOR E=1 TO 100:NEXT
 E:? "↑                              "
550 GOTO 410
560 TRAP 8000:POSITION 2,22:? "GOLD PI
ECES TO ADD";
570 INPUT LN:GOSUB 585:IF X$=CODE$ THE
N MONEY=MONEY+(LN*200):GP=GP+LN
575 POSITION 2,5:GOSUB 130
580 POSITION 2,22:? "
                    ":GOTO 410
585 IF LN>10000 THEN LN=10000
586 RETURN
590 FLAG=0:Z=186:LIN2=2200:HEAD$="BLAD
ED WEAPONS                   ":NI=11:
LINE=2265:GOSUB 330:GOSUB 140:GOTO 340
600 FLAG=0:Z=22:LIN2=3000:HEAD$="POLE
ARMS                         ":NI=15:L
INE=3065:GOSUB 330:GOSUB 140:GOTO 340
610 POSITION 2,21:? "YOU DON'T HAVE E
NOUGH MONEY!!":? "DO YOU WANT TO ADD?"
:OPEN #1,4,0,"K:":GET #1,LNN:CLOSE #1
615 IF LNN=89 THEN TRAP 8000:GOSUB 100
0:IF X$<>CODE$ THEN RETURN
620 IF LNN=89 THEN ? "↑GOLD PIECES TO
ADD";:INPUT LN:GOSUB 585:IF X$=CODE$ T
HEN MONEY=MONEY+(LN*200):GP=GP+LN
625 POSITION 2,0:GOSUB 130
630 POSITION 2,21:? "
                                ↑":RETURN
1000 POSITION 2,21:? "
                                ↑"
1005 POSITION 2,22:? "PASSWORD";:INPUT
 X$:IF X$=CODE$ THEN RETURN
1010 ? "↑                    ":? "↑W
RONG PASSWORD!↑":FOR E=1 TO 100:NEXT E
:GOTO 630
1020 NEXT E:CLOSE #4:RETURN
2065 DATA A),Belt,                    3
 SP,30,0
2066 DATA B),High hard boots,         2
 GP,400,1
2067 DATA C),High soft boots,         1
 GP,200,0
2068 DATA D),Low hard boots,          1
 GP,200,0
2069 DATA E),Low soft boots,          1
 SP,80,0
2070 DATA F),Cap,                     1
 SP,10,0
2071 DATA G),Cloak,                   5
 SP,50,0
2072 DATA H),Broad girdle,            2
 GP,400,0
2073 DATA I),Normal girdle,          10
 SP,100,0
2074 DATA J),Hat,                     7
 SP,70,0
2075 DATA K),Robe,                    6
 SP,60,0
2076 DATA L),Leather breeches,       20
 GP,4000,0
2165 DATA A),Banded armor,            9
0 GP,18000,35
2166 DATA B),Chain armor,             7
5 GP,15000,30
2167 DATA C),Great helmet,            1
5 GP,3000,3
2168 DATA D),Small helmet,            1
0 GP,2000,0
2169 DATA E),Leather armor,
5 GP,1000,15
2170 DATA F),Padded armor,
4 GP,800,10
2171 DATA G),Plate armor,            40
0 GP,80000,45
2172 DATA H),Ring armor,              3
0 GP,6000,25
2173 DATA I),Scale armor,             4
5 GP,9000,40
2174 DATA J),Large shield,            1
5 GP,3000,10
2175 DATA K),Small shield,            1
0 GP,2000,5
2176 DATA L),Small wooden shield,
1 GP,200,3
2177 DATA M),Splinted armor,          8
0 GP,16000,40
2178 DATA N),Studded armor,           1
5 GP,3000,20
2179 DATA O),Bronze Plate,           10
0 GP,20000,55
2180 DATA P),Field Plate,           200
0 GP,400000,75
2181 DATA Q),Full Plate,            400
0 GP,800000,100
2182 DATA R),Buckler Shield,
5 GP,1000,3
2265 DATA A),Bastard sword,           2
5 GP,5000,10
2266 DATA B),Broad sword,             1
```

```
0 GP,2000,7.5
2267 DATA C),Long sword,              1
5 GP,3000,6
2268 DATA D),Short sword,
8 GP,1600,3.5
2269 DATA E),Scimitar,                1
5 GP,3000,4
2270 DATA F),Falchion Sword,          1
0 GP,2000,10
2271 DATA G),Khopesh sword,           1
0 GP,2000,10.5
2272 DATA H),Battle axe,
5 GP,1000,7.5
2273 DATA I),Hand axe,
1 GP,200,5
2274 DATA J),Dagger & Scabbard,
2 GP,400,1
2275 DATA K),Knife & Scabbard,
2 GP,600,15
2365 DATA A),Composite short bow,     7
5 GP,15000,5
2366 DATA B),Composite long bow,     10
0 GP,20000,8
2367 DATA C),Short bow,               1
5 GP,3000,5
2368 DATA D),Long bow,                6
0 GP,12000,10
2369 DATA E),Light crossbow,          1
2 GP,2400,5
2370 DATA F),Heavy crossbow,          2
0 GP,4000,8
2371 DATA G),Arrows (dozen),
1 GP,200,2
2372 DATA H),Quiver (24 capacity),
5 GP,1000,3
2373 DATA I),Arrow (1 silver),
1 GP,200,0
2374 DATA J),Quarrel (20),
2 GP,400,3
2375 DATA K),Sling & Bullets(20),     1
0 SP,100,0
2376 DATA L),Dart,
5 SP,50,0
2465 DATA A),Leather backpack,
2 GP,400,2
2466 DATA B),Large belt pouch,
1 GP,200,1
2467 DATA C),Small belt pouch,        1
5 SP,150,5
2468 DATA D),Bone map case,
5 GP,1000,5
2469 DATA E),Leather map case,        1
5 SP,150,5
2470 DATA F),Large sack,              1
6 CP,16,2
2471 DATA G),Small sack,              1
0 CP,10,5
2472 DATA H),Water(wine)skin,         1
5 SP,150,5
2473 DATA I),50' rope,
4 SP,40,2
2474 DATA J),Tinderbox w/F&S,
1 GP,200,0
2475 DATA K),Thieves' tools,          3
0 GP,6000,0
2476 DATA L),Torch,
1 CP,1,6
2477 DATA M),Hooded lantern,
7 GP,1400,6
2478 DATA N),Bullseye lantern,        1
2 GP,2400,6
2479 DATA O),Flask of oil,
1 GP,200,2
2480 DATA P),Iron spike,
1 CP,1,1
2481 DATA Q),10' Pole,
3 CP,3,10
2565 DATA A),Small tent,              5
0 GP,10000,40
2566 DATA B),Blanket,
2 SP,20,1
2567 DATA C),Cooking utensiles,
2 GP,400,3
2568 DATA D),Mess kit,
1 GP,200,1
2569 DATA E),Hunting knife,           1
5 SP,150,0
2570 DATA F),Bit & bridle,            1
5 SP,150,0
2571 DATA G),Saddle,                  1
0 GP,2000,0
2572 DATA H),Saddle bags,
4 GP,800,0
2573 DATA I),Saddle blanket,
3 SP,30,0
2574 DATA J),Candle,
1 SP,10,0
2575 DATA K),Large wooden chest,      1
7 SP,170,50
2576 DATA L),Large iron box,          2
8 GP,5600,50
2577 DATA M),Small iron box,
9 GP,1800,100
2578 DATA N),Tarpaulin,
4 GP,800,10
2579 DATA O),Hammock,
5 GP,1000,5
2665 DATA A),Prayer beads,
1 GP,200,0
2666 DATA B),Incense stick,
1 GP,200,0
2667 DATA C),Wooden holy Symbol,
7 SP,70,0
2668 DATA D),Iron holy symbol,
2 GP,400,0
2669 DATA E),Silver holy symbol,      5
0 GP,10000,0
2670 DATA F),Gold holy symbol,       20
0 GP,40000,0
2671 DATA G),Holy water,              2
5 GP,5000,0
2672 DATA H),Garlic bud,
5 CP,5,0
2673 DATA I),Metal mirror,            1
0 GP,2000,0
2674 DATA J),Silver mirror,           2
0 GP,4000,0
2765 DATA A),Chicken,
3 CP,3,0
2766 DATA B),Guard dog,               2
5 GP,5000,0
2767 DATA C),Hunting dog,             1
7 GP,3400,0
2768 DATA D),Donkey,
8 GP,1600,0
2769 DATA E),Large hawk,              4
0 GP,8000,0
2770 DATA F),Small hawk,              1
8 GP,3600,0
2771 DATA G),Heavy war horse,        30
0 GP,60000,0
2772 DATA H),Medium war horse,       22
5 GP,45000,0
2773 DATA I),Light war horse,        15
0 GP,30000,0
2774 DATA J),Riding horse,            2
5 GP,5000,0
2775 DATA K),Mule,                    2
0 GP,4000,0
2776 DATA L),Pigeon,                  2
 CP,2,0
2777 DATA M),Pony,                    1
5 GP,3000,0
2778 DATA N),Sheep,
```

```
2 GP,400,0
2779 DATA O),Songbird,
4 CP,4,0
2865 DATA A),Ale (pint),
1 SP,10,1
2866 DATA B),Beer (pint),
5 CP,5,1
2867 DATA C),Merchant's meal,
3 SP,30,0
2868 DATA D),Rich meal,
1 GP,200,0
2869 DATA E),Grain (1 day),
1 SP,10,1
2870 DATA F),Rations (1 week),
3 GP,600,5
2871 DATA G),Iron Rations,
5 GP,1000,7
2872 DATA H),Good wine,          1
0 SP,100,1
2873 DATA I),Watered wine,
5 SP,50,1
2965 DATA A),Axe (hand or throwing),
1 GP,200,5
2966 DATA B),Battle Axe,
5 GP,1000,7.5
2967 DATA C),Bo Stick,
2 SP,40,1.5
2968 DATA D),Club,
1 SP,20,3
2969 DATA E),Mace (Footman'S),
8 GP,1600,10
2970 DATA F),Mace (Horseman's),
4 GP,800,5
2971 DATA G),Morning Star,
5 GP,1000,12.5
2972 DATA H),Sap,
1 GP,200,1
2973 DATA I),Quarter Staff,
2 GP,400,2
2974 DATA J),Lasso,
5 SP,100,1
2975 DATA K),Whip,
5 GP,1000,2
2976 DATA L),Military Pick,
8 GP,1600,6
2977 DATA M),War hammer,
1 GP,200,5
2978 DATA N),Lucern hammer,
7 GP,1400,15
2979 DATA O),Trident & net,
4 GP,800,5
3065 DATA A),Bardiche,
7 GP,1400,12.5
3066 DATA B),Bec de Corbin,
6 GP,1200,10
3067 DATA C),Bill-Guisarme,
6 GP,1200,15
3068 DATA D),Fauchard,
3 GP,600,6
3069 DATA E),Fork Fouchard,
8 GP,1600,8
3070 DATA F),Military Fork,
4 GP,800,7.5
3071 DATA G),Glaive-Guisarme,   1
0 GP,2000,10
3072 DATA H),Guisarme,
5 GP,1000,8
3073 DATA I),Guisarme-Voulge,
7 GP,1400,15
3074 DATA J),Halberd,
9 GP,1800,17.5
3075 DATA K),Hook Fauchard,
9 GP,1800,8
3076 DATA L),Lance,
6 GP,1200,10
3077 DATA M),Awl Pike,
3 GP,600,8
3078 DATA N),Ranseur,
4 GP,800,5
3079 DATA O),Spetum,
3 GP,600,5
8000 ERLN=PEEK(186)+256*PEEK(187):ERR=
PEEK(195)
8010 IF PEEK(195)=8 THEN POSITION 2,22
:? "■INPUT ERROR!  TRY AGAIN.      ":
FOR E=1 TO 150:NEXT E
8015 ? "↑
    ↑"
8020 TRAP 8000:IF ERLN=570 THEN GOTO 5
60
8030 GOTO 615
8500 CMD=PEEK(16):IF CMD>127 THEN CMD=
CMD-128:POKE 16,CMD:POKE 53774,CMD:RET
URN
9000 IF FLAG=1 THEN ? #2,CHR$(18):GOSU
B 40:? #2;CHR$(14);AB$:? #2;CHR$(20):A
B$="":X=1:Y=20
9010 FLAG=FLAG+1:RETURN
10000 REM
10010 RETURN
12000 ? #2:? #2:? #2;"TOTAL ENCUMBRANC
E = ";INT(ENC+MONEY/2000)
12005 ? #2;"GOLD PIECES = ";GP:? #2;"S
ILVER PIECES = ";SP:? #2;"COPPER PIECE
S = ";COP;CHR$(12)
12006 ? "K":POSITION 2,12:? "SAVING DA
TA;  PLEASE WAIT. . ."
```


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CIRCLE #115 ON READER SERVICE CARD

```
12010 OPEN #1,8,0,"D:CHARACTR.DTA":PRI
NT #1;CHAR:PRINT #1;NAM$:CLOSE #1:OPEN
 #1,8,0,NAM$
12020 FOR E=1 TO 30:FOR J=1 TO CHAR
12030 PRINT #1;AT(E,J)
12040 NEXT J:NEXT E
12050 PRINT #1;LNAM$
12060 ? "↑NOW RELOADING CHARACTER GENE
RATOR":? "PLEASE WAIT...":RUN "D:DDC9.
2"
```

•

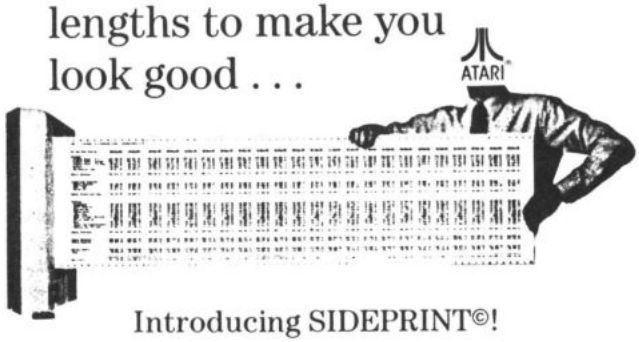
CHECKSUM DATA.

(see page 12)

```
10 DATA 203,460,525,870,994,797,23,569
,507,26,183,443,428,213,540,6781
140 DATA 86,484,796,411,645,267,290,92
,728,440,490,603,273,84,104,5793
290 DATA 525,415,701,591,755,267,903,7
87,284,704,385,823,787,853,119,8899
440 DATA 4,790,302,720,507,720,457,6,7
0,901,916,715,592,965,416,8081
580 DATA 393,581,619,960,193,171,196,8
,393,352,343,803,304,985,12,6313
2066 DATA 93,172,933,163,787,79,755,28
,860,51,791,172,75,206,245,5410
2169 DATA 355,88,186,973,944,60,252,82
9,634,407,217,328,204,484,385,6346
2266 DATA 120,124,190,803,271,873,906,
377,202,418,976,811,859,756,567,8253
2370 DATA 581,46,858,57,554,255,809,59
3,489,612,234,562,513,536,504,7203
2473 DATA 864,1,568,25,420,2,827,765,7
75,96,193,792,440,312,656,6736
2571 DATA 456,653,919,968,987,360,518,
0,669,856,191,438,541,872,658,9086
2671 DATA 135,552,297,511,281,772,190,
469,25,22,420,653,413,217,274,5231
2776 DATA 23,350,61,504,159,641,155,53
9,347,154,261,640,885,679,884,6282
2967 DATA 523,762,214,333,588,771,227,
119,270,373,686,205,974,936,827,7808
3067 DATA 229,440,395,167,414,757,489,
916,367,97,228,504,283,753,193,6232
8015 DATA 189,228,905,122,286,350,539,
42,734,699,440,74,365,82,847,5902
12050 DATA 641,34,675
```

•

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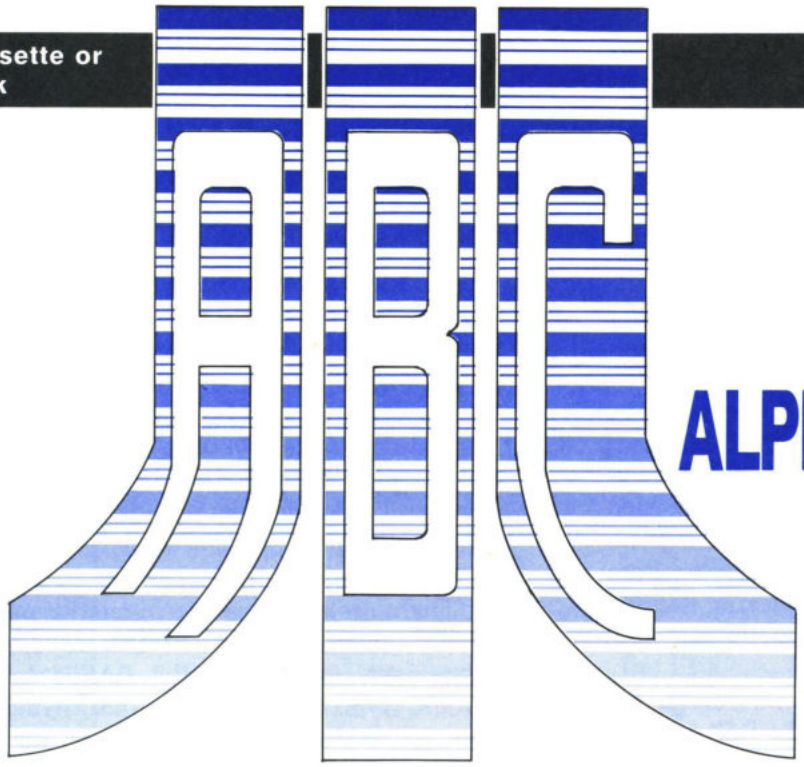
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ALPHABETIZATION and the ATARI

by Brian Schwartz

It's often necessary (or at least desirable) to alphabetize lists. Business files are alphabetized, and so are names in a telephone directory. Many computer programs also have a need for alphabetization. Why, then, are there so few amateur-written programs that can alphabetize items quickly? The answer lies in the fact that alphabetization routines are very complicated for computers and a major undertaking for programmers.

With this in mind, I developed a set of subroutines which can be incorporated into virtually any Atari BASIC program. The subroutines not only alphabetize items very quickly, but provide a method for storing lists of strings, as well.

This article contains material which may seem very technical. If you wish to skip the technical information and just use the subroutines, go straight to the section, "Using the subroutines."

Sorting.

Alphabetization routines fall under the general group of algorithms known as "sorts." Sorting is the ordering of a list. One example would be taking the list of numbers, *3, 1, 2, 6, 5*, and sorting it into the order, *1, 2, 3, 5, 6*.

Alphabetization is the ordering of strings based on the ATASCII values of their characters. Thus, a string with a first character having an ATASCII value of 42 (the asterisk) would come before one with a first character having a value of 67 (the capital letter *C*) in an alphabetized list. Note that all capital letters have lower ATASCII values than all lowercase letters, and a capital letter *Z* would appear before a lowercase letter *A*.

Sorting algorithms vary greatly in technique and efficiency. The time required for different sorts to order the same list can differ immensely. Faster sorts are therefore more desirable, though they're much more complicated. The sort I used is called the "quicksort." As the name implies, it's very fast: in a test I prepared, it sorted three hundred items in under three minutes. Another sort I've worked with in the past, the "bubblesort," used to take more than an hour.

The quicksort.

The quicksort is a recursive algorithm. Recursion is a technique whereby a problem (in this case, an unordered list) is broken down into smaller problems of the same type (in this case, smaller unordered lists), in such a way that the problem is solved as it's broken down.

The quicksort starts with a single list. First it checks its length. If the list consists of only one item, then it's already sorted, and the quicksort is finished. If not, it chooses the first item in the list as a pivot.

It uses two pointers, UP and DOWN. The up pointer moves from the beginning of the list toward the

end, until it finds an item greater (comes afterward in alphabetical order) than the pivot. The down pointer starts at the end of the list and moves toward the beginning, until it finds an item less (comes earlier in alphabetical order) than the pivot. The items pointed to are then exchanged.

The cycle continues (the two pointers continue in their respective directions, and items are exchanged) until UP and DOWN point to the same item. (A pointer, incidentally, is a variable that holds the location of something—in this case, an item in the list.) The pivot item is then exchanged with either the item pointed to by UP or the item before, placing the pivot in the location it should occupy in the alphabetized list.

As a result of the quicksort's action, the single list is broken down into two "sublists." The first consists of those items above the pivot, and the second consists of those below the pivot.

The procedure is repeated for each of the two (hence the recursion). Should the pivot be placed in either the first or last position in the list, only one sublist will be created and worked on. A stack is maintained to store the starting and ending positions of the sublists created by the quicksort.

The subroutines.

Atari BASIC is somewhat weak in its handling of strings (specifically, there are no arrays of strings). Therefore, a whole system had to be devised, which would both allow lists of strings and be easy to use.

The entire list of strings is stored in one string variable, *STORAGE$*. Pointers are used to identify the individual items in STORAGE$. In fact, the quicksort routine never exchanges any actual items—only their pointers. As an example of how the storage system works, the expression, *STORAGE$(POINTERS(N,1), POINTERS(N,2))*, would be used to refer to the nth item in the list.

Five subroutines are provided to handle string storage and alphabetization: (1) the first (Lines 30100-30150) handles initialization; (2) the second (Lines 30200-30220) erases all items from the current list; (3) the third (Lines 30300-30380) adds an item to the end of the current list; (4) the fourth (Lines 30400-30430) returns a particular string requested; and (5) the fifth (Lines 30500-30950) performs the alphabetization.

Using the subroutines.

Type the subroutine package into memory and LIST it to either cassette or disk. To enter a program which will use the subroutines (either one you've written or one of the two demonstration programs) type it in and SAVE it. To run a program which uses the subroutines, LOAD the program, then ENTER the subroutines.

Saving the program in this manner will save storage space, for the subroutine package is stored only once, not with each program using it. If you prefer to not have to enter the subroutine package each time you load a program, save the program after the subroutines have been entered.

There are a few requirements for a program using the subroutines. It must have an "end" statement. Otherwise, the BASIC interpreter would try to run the subroutines, which are appended to the end of the program, resulting in an error. The program must also avoid using the following variables, which are used by the subroutine package:

```
DS    DOWN   INIT      PIVOT$   POINTERS()
SP    STACK() STORAGE$ TEMP     UP
US
```

Additionally, the program should use those variables which pass information from program to subroutine, or from subroutine to program, only as directed.

The five subroutines and functions are those shown here.

Initialization—Before any of the other four functions can be used, you must use the initialization routine:

(1) Set the variable MAXNO *(LET MAXNO=)* equal to the maximum number of items on the list.

(2) Set the variable MAXSIZE equal to the length of the longest string the program will add to the list.

(3) Set the variable MEMALLOCATION equal to the total number of characters of all the strings which may be added to the list. If you are unsure of what that will be, set it equal to *MAXNO*MAXSIZE*.

(4) Execute the initialization routine with a *GOSUB 30100*.

Initialization need only be done once. If a second attempt is made, the initialization routine will ignore it. It's advisable to set all variables slightly higher than needed. BASIC error number 2 (out of memory) will result if the dimensions you set are too high for the memory of your machine.

Clearing workspace—If, at any time, you wish to begin with a new list, execute a GOSUB 30200. Clearing isn't necessary before the first list is created.

Item addition—When a program is first run and after the workspace is cleared, the list is empty. To add an item to the list:

(1) Set the variable ITEM$ equal to the string you wish added to the list.

(2) Execute a GOSUB 30300.

Each time an item's added, the variable NUMITEMS is set by the subroutine to the number of items on the list. Never change the value of this variable. A null string will be ignored. If the item list is already full, the error message *ITEM LIST FILLED* will appear on the screen. If the item's length would extend beyond the storage space, the error message *MME* will appear on the screen. In either case, the item will not be added to the list.

Item retrieval—After an item has been added to the list, it can be retrieved. To do that:

(1) Set the variable ITEMNO equal to the number of the item you want (e.g., *3* for the third item).

(2) Execute a GOSUB 30400.

The variable ITEM$ will then contain the specified item in the list. If the item requested doesn't exist, error message *NO SUCH ITEM* will appear on the screen. To access all of the items on the list, use a loop in the form: *FOR ITEM NO=1 TO NUMITEMS*.

Alphabetization—To alphabetize the list, just execute a GOSUB 30500. Even though the quicksort routine I used is fast, you can make it even faster by replacing GOSUB 30500 with *HOLD=PEEK(559):POKE 559,0:GOSUB 30500:POKE 559,HOLD* — which will turn off the display while the quicksort is working.

For a better understanding of how to use the subroutine package, see Listing 1.

The demonstration programs.

Included in this article are two demonstration programs which use the subroutines. Type them in as described in the previous section. Listing 1 was written as a guide for using the subroutines. It asks for ten names, lets you choose a name number for retrieval, alphabetizes the list of names and prints the alphabetized list both forward and backward. Listing 2 was written as a utility. It takes items from a file you specify, alphabetizes them, and then outputs the alphabetized list to another file you specify.

The subroutine package takes up 3754 bytes of memory (1936 for the subroutines and 1818 for the stack), plus the memory required for the dimensions you set at initialization. This includes 18*(MAXNUM+1) bytes for the number of items you specify, 2*MAXSIZE bytes for the length of the largest item you specify, and MEMALLOCATION bytes for the size of the total list.

Because the subroutines can require a lot of memory for large lists, you may want to design your programs to output lists of strings to disk, then use a separate program, such as Listing 2, to alphabetize the lists.

I hope you'll find these subroutines as useful as I have.

Brian Schwartz is a first-year student at Harvard, where he's concentrating in chemistry and physics. He has owned his Atari 800 for four years and has been programming for seven years. His computer interests include algorithms and graphics.

Listing 1.
BASIC listing.

```
100 REM *** BRIAN SCHWARTZ  ***
110 REM *** ANALOG MAGAZINE ***
120 REM SUBROUTINES DEMONSTRATION 1
130 REM INITIALIZATION
140 MAXNO=20
150 MAXSIZE=40
160 MEMALLOCATION=MAXNO*MAXSIZE
170 GOSUB 30100
180 REM ADD TEN NAMES TO LIST
185 GRAPHICS 0
190 PRINT "ENTER 10 NAMES:"
200 FOR N=1 TO 10
210 PRINT "NAME #";N;
220 INPUT ITEM$
230 GOSUB 30300
240 NEXT N
250 REM RETRIEVE ONE ITEM FROM LIST
255 PRINT
260 PRINT "WHAT ITEM # DO YOU WANT";
270 INPUT ITEMNO
280 GOSUB 30400
290 PRINT "IT IS: ";ITEM$
300 REM ALPHABETIZE LIST
310 GOSUB 30500
320 REM PRINT ENTIRE LIST
323 PRINT
325 PRINT "HERE IS THE LIST ALPHABETIZ
ED:"
330 FOR ITEMNO=1 TO NUMITEMS
340 GOSUB 30400
350 PRINT ITEMNO;"- ";ITEM$
360 NEXT ITEMNO
370 REM PRINT LIST FROM END TO START
375 PRINT
380 PRINT "HERE IT IS BACKWARDS:"
390 FOR ITEMNO=NUMITEMS TO 1 STEP -1
400 GOSUB 30400
```

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```
410 PRINT ITEMNO;"- ";ITEM$
420 NEXT ITEMNO
430 REM REM CLEAR WORKSPACE IF NEEDED
440 PRINT "RUN AGAIN [(1) YES  (2) NO]
";
450 INPUT AGAIN
460 IF AGAIN=2 THEN 490
470 GOSUB 30200
480 GOTO 185
490 REM REQUIRED END STATEMENT
500 END
```

●

CHECKSUM DATA.

(see page 12)

```
100 DATA 191,112,941,445,781,14,848,19
,973,913,572,118,743,240,13,6923
240 DATA 752,840,691,712,610,30,424,42
5,13,774,682,727,62,20,698,7460
360 DATA 383,83,699,493,30,10,688,373,
360,243,238,898,27,742,355,5622
500 DATA 34,34
```

●

Listing 2.
BASIC listing.

```
100 REM *** BRIAN SCHWARTZ  ***
110 REM *** ANALOG MAGAZINE ***
120 REM SUBROUTINES DEMONSTRATION 2
130 DIM INFILE$(20),OUTFILE$(20)
140 MAXNO=400
150 MAXSIZE=250
160 MEMALLOCATION=19000
170 GOSUB 30100
180 GRAPHICS 0
190 PRINT "INPUT FILE";
200 INPUT INFILE$
210 PRINT "OUTPUT FILE";
220 INPUT OUTFILE$
230 OPEN #1,4,0,INFILE$
240 OPEN #2,8,0,OUTFILE$
250 TRAP 290
260 INPUT #1,ITEM$
270 GOSUB 30300
280 GOTO 260
290 GOSUB 30500
300 FOR ITEMNO=1 TO NUMITEMS
310 GOSUB 30400
320 PRINT #2;ITEM$
330 NEXT ITEMNO
340 END
```

●

CHECKSUM DATA.

(see page 12)

```
100 DATA 191,112,944,919,38,228,173,19
,908,64,349,390,700,852,211,6098
250 DATA 736,494,25,729,35,53,11,505,3
74,42,3004
```

●

Listing 3.
BASIC listing.

```
30000 REM *** BRIAN SCHWARTZ  ***
30010 REM ALPHABETIZATION ROUTINE
30020 REM AND SUPPORTING ROUTINES
30030 REM FOR THE ATARI COMPUTERS
30040 REM *** ANALOG MAGAZINE ***
30100 REM INITIALIZATION ROUTINE
30110 IF INIT=1 THEN RETURN
30120 INIT=1
30130 DIM STORAGE$(MEMALLOCATION),ITEM
$(MAXSIZE),PIVOT$(MAXSIZE)
30140 DIM STACK(100,2),POINTERS(MAXNO,
2)
30145 LET POINTERS(0,2)=0
30150 RETURN
30200 REM CLEAR WORKSPACE ROUTINE
30210 NUMITEMS=0
30220 RETURN
30300 REM ADD ITEM TO LIST ROUTINE
30310 IF LEN(ITEM$)=0 THEN RETURN
30320 IF NUMITEMS=MAXNO THEN PRINT "IT
EM LIST FILLED":RETURN
30330 IF POINTERS(NUMITEMS,2)+LEN(ITEM
$)>MEMALLOCATION THEN PRINT "MME":RETU
RN
30340 NUMITEMS=NUMITEMS+1
30350 LET POINTERS(NUMITEMS,1)=POINTER
S(NUMITEMS-1,2)+1
30360 LET POINTERS(NUMITEMS,2)=POINTER
S(NUMITEMS-1,2)+LEN(ITEM$)
30370 STORAGE$(POINTERS(NUMITEMS,1),PO
INTERS(NUMITEMS,2))=ITEM$
30380 RETURN
30400 REM RETRIEVE ITEM ROUTINE
30410 IF ITEMNO>NUMITEMS OR ITEMNO<1 T
HEN PRINT "NO SUCH ITEM":RETURN
30420 ITEM$=STORAGE$(POINTERS(ITEMNO,1
),POINTERS(ITEMNO,2))
30430 RETURN
30500 REM QUICKSORT ROUTINE
30510 IF NUMITEMS<2 THEN RETURN
30520 SP=1
30530 STACK(1,1)=1
30540 STACK(1,2)=NUMITEMS
30550 IF SP=0 THEN RETURN
30560 UP=STACK(SP,1)
30570 DOWN=STACK(SP,2)
30580 SP=SP-1
30590 IF UP=DOWN THEN 30550
30600 PIVOT$=STORAGE$(POINTERS(UP,1),P
OINTERS(UP,2))
30610 US=UP
30620 DS=DOWN
30630 UP=UP+1
30640 IF STORAGE$(POINTERS(UP,1),POINT
ERS(UP,2))>PIVOT$ THEN 30680
30650 IF UP=DOWN THEN 30790
30660 UP=UP+1
30670 GOTO 30640
30680 IF STORAGE$(POINTERS(DOWN,1),POI
NTERS(DOWN,2))<PIVOT$ THEN 30720
30690 IF UP=DOWN THEN 30790
30700 DOWN=DOWN-1
30710 GOTO 30680
30720 TEMP=POINTERS(UP,1)
30730 LET POINTERS(UP,1)=POINTERS(DOWN
,1)
30740 LET POINTERS(DOWN,1)=TEMP
30750 TEMP=POINTERS(UP,2)
30760 LET POINTERS(UP,2)=POINTERS(DOWN
,2)
30770 LET POINTERS(DOWN,2)=TEMP
30780 GOTO 30660
30790 IF STORAGE$(POINTERS(UP,1),POINT
ERS(UP,2))>PIVOT$ THEN UP=UP-1
```



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Alphabetization *continued*

```
30800 TEMP=POINTERS(UP,1)
30810 LET POINTERS(UP,1)=POINTERS(US,1
)
30820 LET POINTERS(US,1)=TEMP
30830 TEMP=POINTERS(UP,2)
30840 LET POINTERS(UP,2)=POINTERS(US,2
)
30850 LET POINTERS(US,2)=TEMP
30860 IF US>UP-1 THEN 30900
30870 SP=SP+1
30880 STACK(SP,1)=US
30890 STACK(SP,2)=UP-1
30900 IF UP+1>DS THEN 30560
30910 SP=SP+1
30920 STACK(SP,1)=UP+1
30930 STACK(SP,2)=DS
30940 GOTO 30560
30950 RETURN
```

CHECKSUM DATA.

(see page 12)

```
30000 DATA 42,752,739,686,179,600,80,7
34,175,291,460,55,642,550,50,6035
30300 DATA 865,767,628,231,960,710,924
,69,63,671,961,55,54,920,379,8257
30520 DATA 605,362,641,432,762,139,68,
561,392,619,103,65,928,570,71,6318
30670 DATA 225,483,578,329,218,623,590
,512,630,601,520,230,288,620,400,6847
30820 DATA 21,627,412,30,498,67,778,22
6,434,56,209,737,221,63,4379
```


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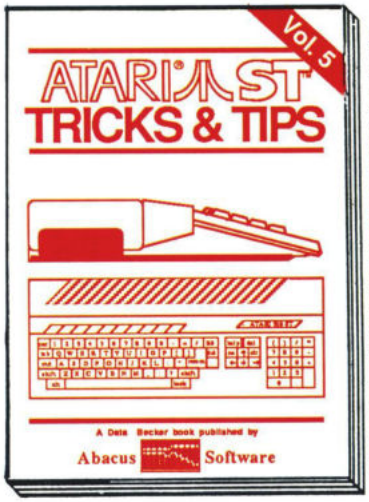
MAY 1986 ISSUE 2

ST Sound Waves
C-manship
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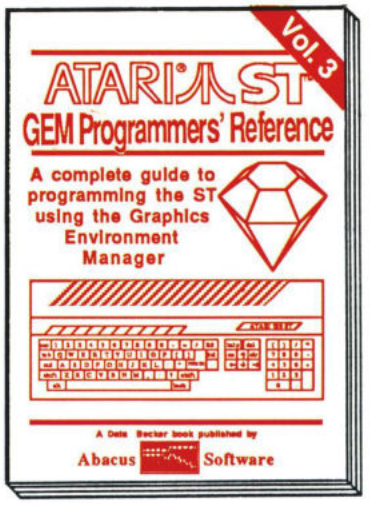


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THE ATARI ST OPERATOR'S MAGAZINE

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An enhanced Pascal, ideal for large-scale production programming.

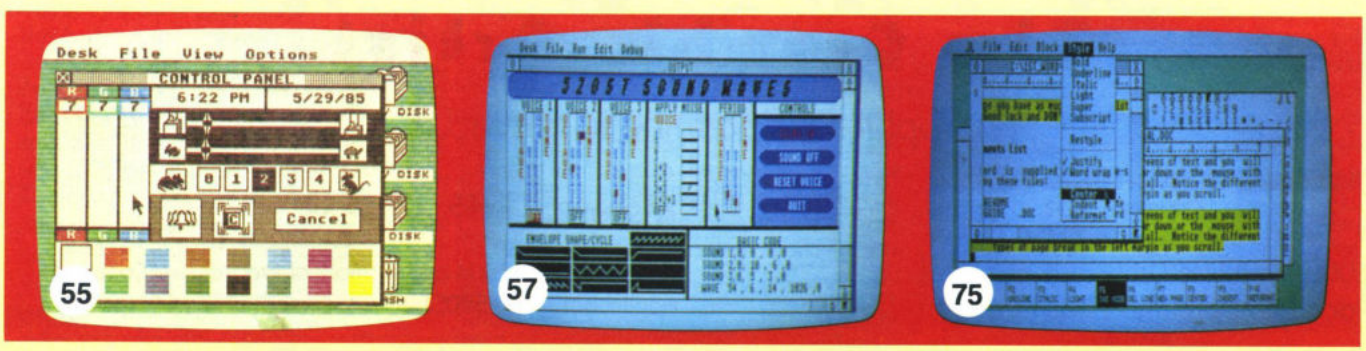
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MODULA-2

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by Sol Guber

A good computer needs good languages in order to utilize all of its capabilities. The Atari 520ST is one of the newest and best computers on the market today, and TDI, has brought out a fine example of what a good language *should* be, **Modula-2**.

First, let me explain what **Modula-2** is, for those who haven't heard of it yet. Niklaus Wirth, the inventor of Pascal, created **Modula-2**. The language is an enhancement and extension of Pascal and has five added features: (1) the module concept, in particular, the facility to split a module into its definition and implementation portions; (2) a more systematic syntax, which facilitates the learning process—every structure starting with a keyword also ends with one (i.e., is properly bracketed); (3) the concept of process as the key to multiprogramming facilities; (4) so-called low-level facilities, which make it possible to breach the rigid type consistency rules and allow you to map data with **Modula-2** structure onto a store with inherent structure; and (5) the procedure type, which allows procedures to be dynamically assigned to variables.

TDI's **Modula-2** compiler implements the full language as described by Dr. Wirth. It includes separate compilation, opaque types, co-routines (pseudo-concurrent processes) and floating-point routines. It is integrated into the GEM environment and will support all the GEM routines. It also promises to generate compact code.

As in all high-level languages, the **Modula-2** package comes in three parts: an editor, a compiler and a linker in a two-disk package. There's no copy protection on any of the disks, and you can arrange the system to fit your needs.

Also included is a nice demonstration of the power of **Modula-2**. Since most programmers don't spend much time with either the compiler or the linker, the editor is the most important part of the package. This editor is very, very nice and quite powerful.

Modula-2's is a full-screen editor which uses both the mouse and function keys. You can point the mouse to the spot where you want to work and click it. This will be the new spot where writing begins. Using the function keys, you can move one word right or left, page up and down, and move a line up and down.

The arrow keys are also used to move around the screen. The deletion function works like the movement functions, with the ability to delete a character right or left, a word right or left, or a line right or left. You can undelete with the undo function.

For large insertions or deletions, you can mark, then cut or paste text into the proper spot. These capabilities are usable both with the mouse and drop-down menus, as are the function keys.

There's one more function unique to this editor, one that I've never seen on another editor. After a program is written, it is compiled. Most of the time, there are errors in the compilation. With **Modula-2**'s compiler, the errors are written to a file on the disk. When you return to the editing mode, the error file and your original file are combined, so there are little @s where the errors occurred.

All errors in the program are examined. There's even a special function key to look for the next @. When the cursor is moved to this spot, a message will be shown at the bottom of the screen, with the error message. The message is further explained in the table of the **Modula-2** book. There are four pages of possible errors, and they're defined well enough that it's easy to correct them and continue.

This listing of the messages in a file that's merged into your own is one sign of the time and effort invested in this fine package. The editor, of course, was written in **Modula-2**.

Figure 1 shows a sample program in **Modula-2**. You can see the various differences between it and Pascal. The first is that there are two parts to the program—a definition module and an implementation module. There's a difference between what a procedure does and what the outside world sees of the program. You must define what will come out of the module. In this case, a cardinal number will be "exported" from the module.

A second difference can be seen in the third-to-last line. The language uses very strong typing. To return a cardinal number from a function that uses a division between "longcards," you must specify that the cardinal number is returned. All procedures and parameters must be typed, so the program will know what kind of variable it's handling.

There are also several subtle points in the example module shown in Figure 1. One that isn't seen is what can be done

with this module. It can be compiled and, when needed by any other program, it can be "imported" into that program. **Modula-2**, unlike Pascal, can link together compiled code via the linker. This means that a library can be put together, then used just as any other function would be.

A second subtle point is the interface between parts of the programs. The definition module explains exactly what another part of the program will "see" of the implementation module. The only thing visible to the outside environment is the procedure "random," since it's the only thing exported out. Variables, variable types and other procedures can be exported out, too. Objects declared in other modules can be referenced in module M, if they're explicitly made to be known in M (i.e., if they're "imported" into M).

The major strength of **Modula-2** is that many of its parts are hidden from the other portions. It's very easy to write and debug parts of programs, since you know exactly how they'll fit together; this has to be specified in the definition section of the module.

Also, the fine details of a system need not be known at any higher level. The same program can be written for two different machines, and each will have specific I/O that will be imported when needed.

In terms of I/O, you may wish to have them available, but don't need to know—or, rather, don't want to bother to learn—how this works in detail. In many cases, you may even wish to hide parts away from access, to guarantee that they'll work correctly.

There are several extensions to **Modula-2** that were proposed by N. Wirth. They include a change in the case syntax, a new variable type called "string," and two new variables for 32-bit machines called "longcard" and "longint." There is optimization for Boolean constants. The "set" type is supported by several new features, and you're allowed to have open array parameters.

The most exciting part of the language is its having both high-level and low-level implementation. For the low-level portion, there's a procedure "code," which allows for the insertion of machine language into the object code. There's "setreg," to put values into one of the 68000 processor's registers, as well as "register," to return values.

On the high-level end, there's the "type process," as well as procedure "newprocess." "Iotransfer" moves to different peripheral devices as needed, and procedure "listen" services the interrupts. The "newprocess" is used to have concurrent programming.

I've started using this language and have found no bugs at all. There are some typos in the documentation, but none of these are significant. I've typed in several of the programs from N. Wirth's book *Programming in Modula-2*, and they've worked perfectly.

The major weakness of the package is in the documentation of the GEM routines. You're expected to have read the GEM manuals. Without them, many GEM routines cannot be used properly. Except for this flaw, I have no qualms recommending this language to anyone. It's a good way to move away from DRI's C.

Sol Guber is a Chemical Engineer with a large petroleum servicing company in the Midwest. He has a seven-year-old daughter who corrects both his articles and games—now that her writing skills have improved. He's been programming the Atari 800 for four years and now has an 520 ST, which his daughter lets him use once in a while.

Figure 1.

```
DEFINITION MODULE RandomNumbers ;

(*$*------------------------------------------------------------------*$*)
(*  (c) Copyright 1985 1985 TDI Ltd.   All Rights Reserved           *)
(*$*------------------------------------------------------------------*$*)

EXPORT Random ;

PROCEDURE Random(MaxValue : LONGCARD) : CARDINAL ;

END RandomNumbers.


IMPLEMENTATION MODULE RandomNumbers;

CONST
    M = 10000000 ;
    m1 = 10000 ;
    b = 31415821 ;

VAR seed : LONGCARD;

PROCEDURE Random(MaxValue : LONGCARD) : CARDINAL ;

    PROCEDURE Multiply(p, q : LONGCARD) : LONGCARD ;

    VAR p0, q0, q1, p1 : LONGCARD ;

    BEGIN
        p1 := p DIV m1 ;
        p0 := p MOD m1 ;
        q1 := q DIV m1 ;
        q0 := q MOD m1 ;
        RETURN (((p0*q1 + p1 * q0) MOD m1) * m11 + p0*q0) MOD M;
    END Multiply;

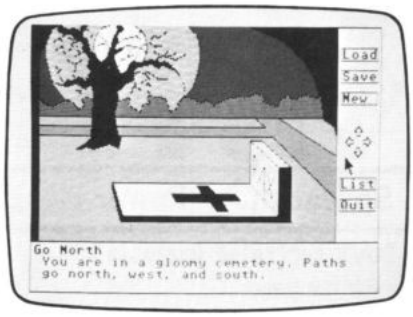
BEGIN
    seed := (Multiply (seed,b) + 1) MOD M ;
    RETURN CARDINAL (((seed DIV m1) * MaxValue) DIV m1) ;
END Random ;

BEGIN (*  MODULE  *)
   seed := 349887 ;
END RandomNumbers.
```

ST NEWS!

POLARWARE

Penguin Software adds to their Comprehend Interactive Novel series with **The Coveted Mirror**, **Frank and Ernest** and **Oo-Topos**. Pictured below is **Transylvania**, an earlier series offering.



Transylvania.

In **Mirror**, the evil King Voar has taken control of Starbury and its residents, and seeks the last piece of the magical, broken mirror which would make him invincible. It's up to you to stop him. The second new title is a cartoon novel based on the **Frank and Ernest** comic strip, while **Oo-Topos** is a science fiction novel.

Another Penguin game, **Sword of Kadash**, is a fantasy adventure with over 200 rooms, each having its own puzzles.

These adventures retail for $39.95 each, from Polarware/Penguin Software, 2600 Keslinger Road, P.O. Box 311, Geneva, IL 60134 — (312) 232-1984.

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SUPRADRIVE

The **SupraDrive** hard disk for the 520ST and 1040ST is available in 10-, 20-, 30- and 60-megabyte formats, ranging in price from $799 to $1995. The drives are said to be compatible with TOS and all applications software.

The drive comes ready for connection to the ST and improves disk transfer rates 300% to 1000% over the stock drives. The ST is also capable of booting directly from the **SupraDrive** upon initialization. The hard disk comes complete with a utilities disk containing backup, formatting and partitioning programs.

For additional information, please contact Supra Corporation, 1133 Commercial Way, Albany, NY 97321 — (503) 967-9075.

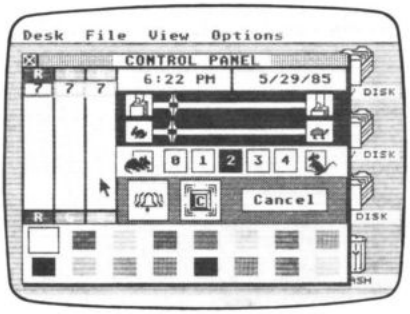
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Shanner is marketing the **SPC-700CI**, a 7-color graphic printer. Some of the printer's features include: color mixing without smudging, pin- or friction-feed, parallel interface and low noise. The printer is capable of printing at 38 or 50 characters/second, on normal paper. Black, yellow, magenta and cyan are combined on a special ribbon. When intermingled, this produces up to seven colors.

The **SPC-700CI** retails for $299.95. Contact Shanner International Corp., 453 Ravendale Drive, Mountain View, CA 94043.



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OTHER NEWS

Batteries Included will shortly be releasing **I*S TALK**, a telecommunications program with plenty of power and ease of use. A 50,000-word spelling checker and three levels of macros are also featured.

Also due is **I*S TIME**, a time management and billing system for professionals. From Batteries Included, 30 Mural Street, Richmond Hill, Ontario, Canada L4B 1B5 — (416) 881-9941. CIRCLE #175 ON READER SERVICE CARD

■ ■ ■

Lamar Micro offers a **1-megabyte 520ST upgrade** for $300, giving the user over 750K or RAM. In conjunction with their **RAM Overdrive**, the upgrade lets you set aside the upper 512K of RAM as a ramdisk. **RAM Overdrive** retails for $34.95, from Lamar Micro, 2107 Artesia Boulevard, Redondo Beach, CA 90278. CIRCLE #176 ON READER SERVICE CARD

■ ■ ■

Commnet Systems specializes in telecommunications software and currently offers **ST-Term**. Their newest release is **FoReM ST**, an ST BBS. Some of the many highlights include: a feature-packed message and file system, E-Mail capability and Sysop commands. For additional information, contact Commnet Systems, 7348 Green Oak Terrace, Lanham, MD 20706 — (301) 552-2517.

CIRCLE #132 ON READER SERVICE CARD

■ ■ ■

Infocom is now a subsidiary of Activision. While the consumer probably won't notice any changes in the near future, one thing to look for may be the release of **Cornerstone**, the powerful IBM productivity package that never quite made it in the marketplace. The original $495 price may dwindle down to $100-$150 if ported to the ST.

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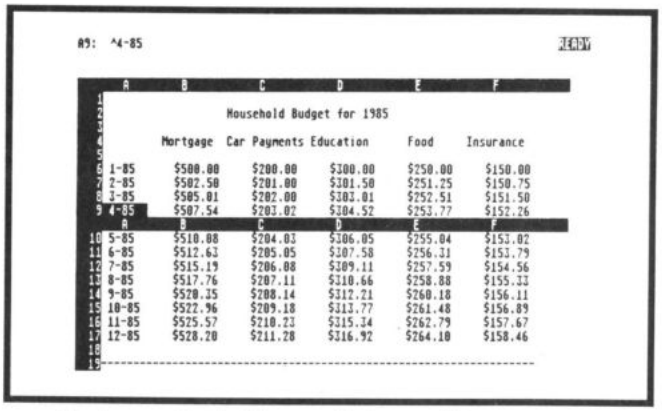
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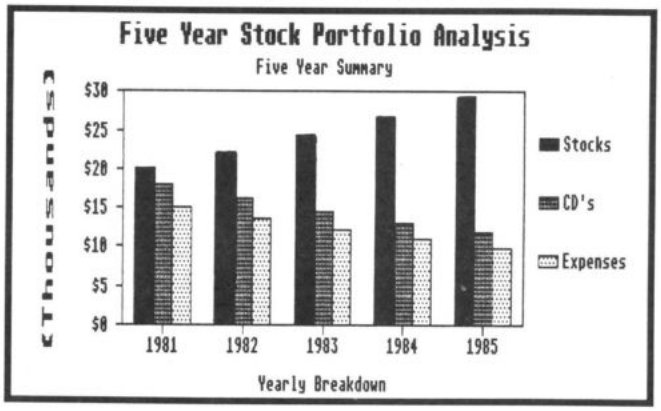


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5-85	$510.08	$204.03	$306.05	$255.04	$153.02
6-85	$512.63	$205.05	$307.58	$256.31	$153.79
7-85	$515.19	$206.08	$309.11	$257.59	$154.56
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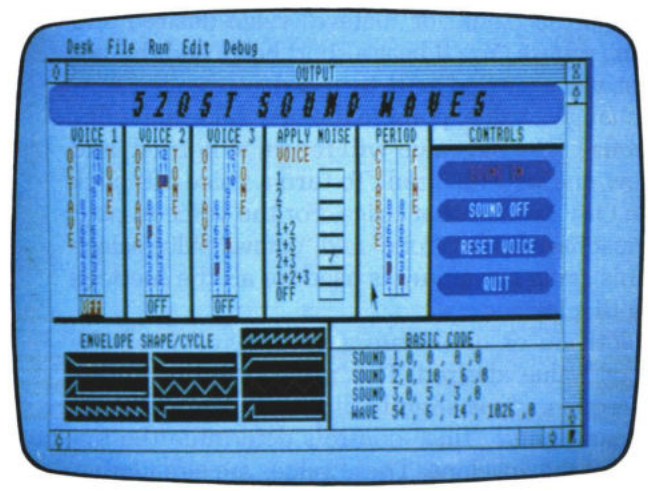
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SYSTEM REQUIREMENTS: Amiga with 512K; One disk drive; Monochrome or color monitor; Works with printers supported by the Workbench.

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ST Sound Waves



by James Luczak

The one thing that stands out most about demos and programs available for the Atari 520ST is the silence surrounding the machine. I've owned an Atari since 1979 and have watched sound routines progress, from simple one-voice melodies to the truly amazing sound productions now possible on the Atari 8-bit line of computers.

It may seem hard to believe, but the 520ST is capable of producing sound as good as, if not better than the 8-bit computers. However, there's one problem—a lack of information concerning the 520ST's sound capabilities. As you may have noticed, there are two commands in ST BASIC that can be used to produce sounds. These are "sound" and "wave." The sound command is well documented and more or less self-explanatory. The wave command is another sotry. There's almost no useful information in the *ST BASIC Sourcebook* on how to use the wave command.

ST Sound Waves has two purposes: to demonstrate how to use the sound capabilities of the 520ST and to let you get a feel for programming in ST BASIC.

About the program.

Sound Waves is written in a modular fashion. This means that everything, from drawing different parts of the display to producing a sound, is contained in its own module. Each module is accessed via GOSUB as it's needed. I chose this method because it's very easy to follow what each part of the program is doing.

VDISYS() and GEMSYS().

The VDISYS() and GEMSYS() commands are very powerful tools in ST BASIC. The VDISYS() command gives you full access to the GEM VDI (Virtual Display Interface) library. This, in effect, gives you an additional 120+ functions available in the VDI library. The GEMSYS() command gives you full access to GEM's AES (Application Environment Services) library and an additional 60+ functions. Unfortunately, an explanation of how to use the VDISYS() and GEMSYS() commands is beyond the scope of this article. However, once you get the program running, you can bypass one of the modules and see what shows up missing. Using this method, you can determine what the various VDISYS() or GEMSYS() calls are doing.

Using Sound Waves.

Sound Waves is meant to be run in medium resolution. By applying a modifier to all vertical references (the variable *MODY*), I tried to make provisions to run the program in high resolution, but, since I don't have a monochrome monitor, I haven't been able to test the program. If you're going to use high resolution, you may have to make some adjustments to get the display to show up correctly.

Before loading **Sound Waves**, Listing 1, turn buffered graphics off. Now you're ready to use the program.

The display screen is divided into eight sections: one for each of the three "voices," and sections for

noise, period, controls, wave shape, and BASIC code display. To activate a voice, simply move the mouse pointer to the "tone" or "octave" value desired and click the mouse. You'll hear a short beep, and the value that you selected will turn red.

To change a value, point to the new value and click the mouse. The old value will return to normal, and the new one will turn red. To turn a voice off, click on the OFF box for that voice. For the voice to play, you must have both a "tone" and "octave" value selected. This same procedure is used for all the sections of the display.

To activate or deactivate a section, click on the "box" or "value" desired. The "period" section ("envelope frequency") is slightly different. The values in the "coarse" and "fine" controls determine the frequency of the envelope. These values are cumulative.

For example, if you click on coarse 1, then on fine 7, both values will turn red. The values will add together to produce a longer period. To deactivate a period value, click on the value that is active (red). The value will return to normal. You can have all (or any combination) of the values in the coarse and fine controls active at once.

As you select different values, the BASIC code required to produce the tone is displayed in the BASIC section of the display. This section is automatically updated each time you make a change. If you create a sound you want to reproduce in your own program, simply jot down the code that appears in the BASIC code section.

Using the mouse.

Since this program is written entirely in BASIC, the mouse click is probably slightly slower than you're used to. Hold the mouse button (left) a little longer than usual. After you click the mouse and hear the beep, move the mouse pointer away from the area that you clicked on.

The wave command.

Table 1 breaks down the "wave" command and its parameters. The first parameter ("enable") can have

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Benchmark	Compile Time	Execute Time	Size
Sieve	70	2.78	5095
"Hello, world"	63	N/A	4691

*Times in seconds. Sieve with register variables.

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WHAT IS ST-CHECK?

Most program listings in **ST-Log** are followed by a table of numbers appearing as DATA statements, called "ST CHECKSUM DATA." These numbers are to be used in conjunction with **ST-Check** (which appeared in **ANALOG Computing/ST-Log** issue 41.

ST-Log (written by Clayton Walnum) is designed to find and correct typing errors when readers are entering programs from the magazine. For those readers who would like copies of these articles, you may send for back issue 41 ($4.00).

ANALOG Computing/ST-Log
P.O. Box 625, Holmes, PA 19045

a value from 1 to 63, depending on what combination of voices and noise you select. The values in the chart are typical. The enable parameter is a 6-bit word that enables the "tone" and "noise" channels. Table 2 shows a breakdown of the "enable word." The envelope, shape, period and delay parameters shown in Listing 1 are the actual values to use.

First impressions of ST BASIC.

One of the reasons I wrote this program was to get a feel for programming in ST BASIC. The language itself has a nice variety of powerful and versatile commands from which to choose.

The label option (the ability to name a line) is quite useful for making program listings easier to read. As I previously described, the VDISYS() and GEMSYS() commands give you full access to the VDI and AES libraries. These two commands more than double the number of functions available from ST BASIC—if you know how to use them. And, as far as pure number crunching is concerned, ST BASIC is very fast.

It does have some serious drawbacks that will keep it from being a very useful language. The biggest problem is with its windows. Windows have no place in a computer language. They make it cumbersome, at best, to write a program of any length (for me, it's impossible). They also slow any output to the screen to such a degree that the 68000's speed advantages are totally defeated.

The editor is a disgrace. Once you have the lines you want to work on in the edit window, you can move the cursor to the area you want to edit. Then, as soon as you press a key, the line you're editing turns a very light shade of grey! If this isn't bad enough, the text in the line being edited becomes slightly skewed. On top of all of this, the symbols in the line being edited change. For instance, the plus sign turns into an arrow that points to the left. All of this makes it next to impossible to read the line you're trying to edit.

Fortunately, there's a way around this mess. Apparently, the team that wrote ST BASIC was aware of these problems. ST BASIC programs are written to disk as text files. This being the case, you can use any text or word processor that produces standard text files to write your program. That's the method I used to write this program. Text processors such as **MicroEMACS**, **Mince** or **Letter Express** work just fine. (**ST Writer** will not work; the files it produces are nonstandard files.)

When ST BASIC loads a saved program, it checks each line for syntax errors. If it finds one, it prints the number of the line containing the error and a

Table 1.

THE WAVE COMMAND

SYNTAX: WAVE enable,envelope,shape,period,delay

ENABLE — Enables VOICE or NOISE, or VOICE with NOISE

CHANNEL	TONE VALUE	NOISE VALUE	NOISE with TONE VALUE
1	1	8	9
2	2	16	18
3	4	32	36
1+2	3	24	27
1+3	5	40	45
2+3	6	48	54
1+2+3	7	56	63

ENVELOPE — Enables ENVELOPE for VOICES

VOICE	VALUE
1	1
2	2
3	4
1+2	3
1+3	5
2+3	6
1+2+3	7

SHAPE — SHAPE/CYCLE control

VALUE	DESCRIPTION
1-3	alternate,hold
4-7	attack,alternate,hold
8	continue
9	continue,hold
10	continue,alternate
11	continue,alternate,hold
12	continue,attack
13	continue,attack,hold
14	continue,attack,alternate)
15	continue,attack,alternate,hold

PERIOD — Controls frequency of the ENVELOPE

VALUE	DESCRIPTION
001-128	FINE tune value
256-32768	COARSE tune value

DELAY — Sets time in 1/50-second increments before BASIC resumes execution

Use any desired value. If your WAVE command doesn't seem to be working the way you think it should, try increasing this value.

HOW TO USE THE WAVE COMMAND.

First, use the SOUND command to select the voice or voices desired, and set the NOTE and OCTAVE values. Set the VOLUME and DURATION to 0. When using the WAVE command, the VOLUME and DURATION values in the SOUND command are disabled. Next, set the values for the WAVE command. As your program runs, the SOUND command will take on the parameters set in the WAVE command.

Table 2.

THE ENABLE PARAMETER

BIT	FUNCTION		DECIMAL VALUE
0	Tone	Channel 1	1
1	Tone	Channel 2	2
3	Tone	Channel 3	4
4	Noise	Channel 1	8
5	Noise	Channel 2	16
6	Noise	Channel 3	32

description of the error, then continues to load the rest of the program.

This undocumented feature makes it even easier to use an external text processor to write programs. All you have to do is write down the line numbers and use ST BASIC's editor to correct the errors. This reduces your exposure to ST BASIC's editor.

Like any programming language, ST BASIC has its share of bugs. Most of those I encountered were minor and could be worked around. However, there's one that's very serious.

After your program grows larger than about 10K, this program killer shows up. When you try to save your program (SAVE AS / REPLACE), ST BASIC will erase any previous copy with the same name of your program on disk, then lock up.

There's no way out. You have to press the RESET key. If you haven't taken the precaution of saving your program under a different name, or on another disk, you'll lose your entire program.

There's a way to avoid this nasty little bug: before saving your program, type *CLEARW 2* (Clear window 2), then SAVE your program. This seems to eliminate the bug, but I like to stay on the safe side when writing large programs, and always keep a copy of the program on another disk—just in case.

Jim Luczak maintains and operates electronic telephone switching and processing equipment. He's been writing computer programs since 1979, having bought his first Atari in 1980, and has written in BASIC, C, LOGO, FORTH, Action!, and 6502 assembly. He enjoys writing dedicated database programs.

Listing 1.
ST BASIC listing.

```
100 '520ST SOUND WAVES  Revision 1.0
110 '****** by JIM LUCZAK ******
120 sy=peek(systab)
130 if sy=1 then 150
140 if sy=2 then 170
150 filcol=1:filcol1=1:mody=2
160 goto 240
170 filcol=2:filcol1=3:mody=1
180 poke contrl,26:poke contrl+2,0:pok
e contrl+6,2:poke intin,3
190 poke intin+2,1:vdisys(1)
200 ri=peek(intout+2):gi=peek(intout+4
):bi=peek(intout+6)
210 poke contrl,14:poke contrl+2,0:pok
e contrl+6,4:poke intin,3
220 poke intin+2,0:poke intin+4,0:poke
 intin+6,1000:vdisys(1)
230 ' --- PROGRAM INITIALIZATION ---
240 coorx=605:coory=40*mody:coorx1=3:c
oory1=22*mody:cellh=8
250 a#=gb:gintout=peek(a#+12):gintin=p
eek(a#+8)
260 dim vvl(13),vpl(8),hpl(2),mhl(26),
mvl(58),vld(26),vc(3),vn(3),vo(3)
270 dim nvl(8),pc(8),pc1(8),pf(8),pf1(
8),pvo1(6),pvo2(8),pvn1(6),pvn2(12)
280 dim cvl(4),nc(3),en1(24),ev1(3),ev
2(3),ev3(3)
290 for x=1 to 26:read mhl(x):next x:m
vl(1)=132:mvl(2)=123
300 for x=1 to 26:read vld(x):next x
310 read nhl:for x=1 to 8:read nvl(x):
next x
320 for x=0 to 23:read en1(x):next x
330 for x=1 to 8:read pc(x),pf(x):next
 x
340 for x=1 to 4:read cvl(x):next x
350 ' -------- DRAW SCREEN ----------
360 fullw 2:clearw 2
370 gosub DOHEADER:wm=2:gosub WRITEHEA
DER
380 x1=50:x2=80:x3=2:x4=1:gosub DOVBAR
S
390 wm=4:gosub SETWRITEMODE:gosub DOOF
F:wm=2:gosub SETWRITEMODE
400 x2=6:gosub DOVBARTEXT
410 x3=6:x4=1:mv=3:gosub DOVBARNUM
420 gosub DONOISE
430 gosub DOPERIOD
440 gosub DOCONTROLS
450 gosub DOSHAPE
460 color 1,1,1:gotoxy 47,13*mody:?"BA
SIC CODE";
470 gosub DOLINES
480 wm=1:gosub SETWRITEMODE
490 ' ------ MAIN PROGRAM LOOP ------
500 poke gintin,257:gemsys(78)
505 poke systab+24,1
510 while mkey <> 2:gemsys(79)
520 mx=peek(gintout+2):my=peek(gintout
+4):mkey=peek(gintout+6)
530 if mkey=1 then gosub CHECKKEY
540 wend
545 poke systab+24,0
550 poke gintin,256:gemsys(78):clearw
2
560 poke contrl,14:poke contrl+2,0:pok
e contrl+6,4:poke intin,3
570 poke intin+2,ri:poke intin+4,gi:po
ke intin+6,bi:vdisys(1)
580 clear:end
600 CHECKKEY:
610 gosub CHECKMOUSEHLOC
620 if hc1=14 then return
630 if hc1=10 and hc2=1 then 650
640 sound 1,0,5,7,0:wave 1,1,1,256,0
650 gosub DOPARAMETERS
660 gosub DOCHANGE
670 gosub DOBASICCODE
680 return
700 DOHEADER:
710 poke contrl,23:poke contrl+2,0:pok
e contrl+6,1:poke intin,2:vdisys(1)
720 poke contrl,24:poke contrl+2,0:pok
e contrl+6,1:poke intin,5:vdisys(1)
730 poke contrl,25:poke contrl+2,0:pok
e contrl+6,1:poke intin,filcol1:vdisys
(1)
740 poke contrl,11:poke contrl+2,2:pok
e contrl+6,0:poke contrl+10,9
750 poke ptsin,coorx:poke ptsin+2,coor
y:poke ptsin+4,coorx1
760 poke ptsin+6,coory1:vdisys(1):retu
rn
780 WRITEHEADER:
790 gosub SETWRITEMODE
800 poke contrl,12:poke contrl+2,1:pok
e contrl+6,0
810 poke ptsin,0:poke ptsin+2,10:vdisy
s(1)
820 poke contrl,106:poke contrl+2,0:po
ke contrl+6,1:poke intin,5:vdisys(1)
```

```
830 color 1,1,1
840 read tnum,x,y:poke contrl,8:poke c
ontrl+2,1:poke contrl+6,tnum
850 for tx=0 to tnum-1:read ascii:poke
 intin+(tx*2),ascii:next tx
860 poke ptsin,x:poke ptsin+2,y:vdisys
(1)
870 poke contrl,12:poke contrl+2,1:pok
e contrl+6,0
880 poke ptsin,0:poke ptsin+2,6:vdisys
(1)
890 poke contrl,106:poke contrl+2,0:po
ke contrl+6,1:poke intin,0:vdisys(1)
900 return
920 DOVBAR5:
930 poke contrl,23:poke contrl+2,0:pok
e contrl+6,1:poke intin,0:vdisys(1)
940 bary=122*mody:bary1=50*mody
950 for x=x1 to (x2*x3)+x1 step x2
960 poke contrl,11:poke contrl+2,2:pok
e contrl+6,0:poke contrl+10,1
970 poke ptsin,x:poke ptsin+2,bary:pok
e ptsin+4,x-15:poke ptsin+6,bary1
980 vdisys(1)
990 poke ptsin,x+15:poke ptsin+2,bary:
poke ptsin+4,x:poke ptsin+6,bary1
1000 vdisys(1):if x4=1 then gosub OFFB
OX
1010 next x:return
1020 OFFBOX:
1030 poke ptsin,x+15:poke ptsin+2,bary
+(10*mody)
1040 poke ptsin+4,x-15:poke ptsin+6,ba
ry
1050 vdisys(1)
1060 return
1080 DOVBARTEXT:
1090 gotoxy 3,2*mody:?"VOICE 1":gotoxy
 12,2*mody:?"VOICE 2"
1100 gotoxy 21,2*mody:?"VOICE 3"
1110 DOVTEXT:
1120 poke contrl,8:poke contrl+2,1:pok
e contrl+6,1
1130 color filcol,1,1:for tx=1 to x2
1140 read tnum:read x:for x1=1 to tnum
:read ascii
1150 poke intin,ascii:poke ptsin,x:pok
e ptsin+2,bary1+(cellh*x1)
1160 vdisys(1):next x1,tx:color 1,1,1:
return
1180 DOVBARNUM:color filcol1,1,1
1190 poke contrl,12:poke contrl+2,1:po
ke contrl+6,2:poke ptsin,0
1200 poke ptsin+2,4:vdisys(1):cellh=pe
ek(ptsout+6)
1210 poke contrl,8:poke contrl+2,1
1220 for x2=1 to x3:tnum=1:read x1,x:g
osub SAVEHLOC
1230 for tx=0 to x1-1:read ascii:if tx
>=9 then tnum=2
1240 poke contrl+6,tnum:poke intin,asc
ii
1250 if tnum=2 then read ascii:poke in
tin+2,ascii
1260 poke ptsin,x:poke ptsin+2,bary-(c
ellh*tx)
1270 vdisys(1):if x2=2 then gosub SAVE
VLOC
1280 next tx,x2
1290 poke contrl,12:poke contrl+2,1:po
ke contrl+6,0
1300 poke ptsin,0:poke ptsin+2,6:vdisy
s(1)
1310 cellh=8:color 1,1,1:return
1330 DONOISE:mod1=10:x4=2
1340 gotoxy 30,2*mody:?"APPLY NOISE":c
olor filcol,1,1
1350 gotoxy 30,3*mody:?"VOICE":color 1
,1,1
1360 read x:for x1=1 to 8:poke contrl,
8
1370 poke contrl+2,1:read tnum:poke co
ntrl+6,tnum
1380 for tx=0 to tnum-1:read ascii:pok
e intin+(tx*2),ascii:next tx
1390 poke ptsin,x:poke ptsin+2,bary1+(
cellh*x1)+mod1:vdisys(1)
1400 poke contrl,11:poke contrl+2,2:po
ke contrl+6,0:poke contrl+10,1
1410 poke ptsin,x+80:poke ptsin+2,bary
1+(cellh*x1)+mod1
1420 gosub SAVEVLOC
1430 poke ptsin+4,x+50:poke ptsin+6,(b
ary1+(cellh*x1))+(mod1-7):vdisys(1)
1440 next x1:x=nh1:np1=8:ascii=8:tnum=
1
1450 y=nv1(np1):gosub MAKECHANGE:retur
n
1470 DOLINES:
1480 poke contrl,16:poke contrl+2,1:po
ke contrl+6,0:poke ptsin,6
1490 poke ptsin+2,0:vdisys(1)
1500 linef coorx1,112,coorx,112:linef
450,29,605,29
1510 poke ptsin,3:vdisys(1)
1520 linef 90,coory1-3,90,112:linef 17
0,coory1-3,170,112
1530 linef 255,coory1-3,255,112:linef
365,coory1-3,365,112
1540 linef 450,coory1-3,450,112:linef
332,112,332,190
1550 linef 332,126,605,126
1560 poke ptsin,1:vdisys(1):return
1580 DOPERIOD:
1590 gotoxy 43,2*mody:?"PERIOD"
1600 x1=412:x2=1:x3=0:x4=0:gosub DOVBA
R5
1610 x2=2:gosub DOVTEXT
1620 x3=2:x4=3:gosub DOVBARNUM
1630 return
1650 DOCONTROL5:
1660 gotoxy 55,2*mody:?"CONTROL5"
1670 poke contrl,23:poke contrl+2,0:po
ke contrl+6,1:poke intin,2:vdisys(1)
1680 poke contrl,24:poke contrl+2,0:po
ke contrl+6,1:poke intin,4:vdisys(1)
1690 poke contrl,25:poke contrl+2,0:po
ke contrl+6,1:poke intin,filcol1
1700 vdisys(1)
1710 poke contrl,114:poke contrl+2,2:p
oke contrl+6,0:poke ptsin,605
1720 poke ptsin+2,132*mody:poke ptsin+
4,453:poke ptsin+6,52*mody:vdisys(1)
1730 poke contrl,23:poke contrl+2,0:po
ke contrl+6,1:poke intin,1:vdisys(1)
1740 poke contrl,11:poke contrl+2,2:po
ke contrl+6,0:poke contrl+10,9
1750 x1=68*mody:x2=0:x3=18*mody:x4=4:x
5=1
1760 for y1=x1 to x1+(x3*3) step x3:x2
=x2+1
1770 poke ptsin,595:poke ptsin+2,y1:po
ke ptsin+4,460:poke ptsin+6,y1-10
1780 vdisys(1):gosub SAVEVLOC:next y1
1790 a$(1)="SOUND ON":a$(2)="SOUND OFF
":a$(3)="RESET VOICE":a$(4)="QUIT"
1800 color 0,1,1:x1=55:for x=0 to 3:if
 x=3 then x1=57
1810 if x=2 then x1=54
1820 gotoxy x1,(4*mody)+(x*2):?a$(x+1)
:next x:color 1,1,1:return
1840 DOSHAPE:
1850 x4=5:gotoxy 4,13*mody:?"ENVELOPE
SHAPE/CYCLE"
1860 poke contrl,11:poke contrl+2,2:po
ke contrl+6,0:poke contrl+10,1
```

```
1870 read x:for tx=1 to x:read x1,y1:x
2=x1-100:y2=y1-10*mody:y1=y1*mody
1880 poke ptsin,x1:poke ptsin+2,y1:pok
e ptsin+4,x2:poke ptsin+6,y2
1890 vdisys(1):if tx>6 then gosub SAVE
VLOC
1900 next tx
1910 poke contrl,6:poke contrl+6,0
1920 color 1,1,0:read tnum:for tx1=1 t
o tnum
1930 gosub MAKESHAPE
1940 next tx1:return
1960 DOBASICCODE:
1970 gotoxy 40,14*mody:?"SOUND 1,0,"vn
(1)","vo(1)",0    "
1980 gotoxy 40,15*mody:?"SOUND 2,0,"vn
(2)","vo(2)",0    "
1990 gotoxy 40,16*mody:?"SOUND 3,0,"vn
(3)","vo(3)",0    "
2000 gotoxy 40,17*mody:?"WAVE "en","ev
","sh","pd",0     ";
2010 return
2030 CHECKMOUSEHLOC:
2040 mc=0:hc=1:hc1=1:hct=20
2050 if my>137 then hc=21:hc1=11:hct=2
6
2060 while mc=0
2070 if mx >= mh1(hc) and mx <= mh1(hc
+1) then mc=1
2080 if mc=0 then hc1=hc1+1
2090 hc=hc+2:if hc>hct then mc=1
2100 wend:if hc1>10 and hct=20 then hc
1=14
2110 if hc1 <=6 then hc2=0 else hc2=1
2130 CHECKMOUSEVLOC:
2140 if hc1=14 then hc2=-1:return
2150 mc=0:mc1=0:hc=vld((hc1*2)-1):hct=
vld(hc1*2)
2160 while mc=0
2170 if my <=mv1(hc) and  my >= mv1(hc
+1) then mc=1:mc1=1
2180 if mc=0 then hc2=hc2+1
2190 hc=hc+2:if hc>hct then mc=1
2200 wend:if mc1=0 then hc1=14:hc2=-1
2210 return
2230 DOPARAMETERS:
2240 if hc1 < 7 then gosub SETSOUND
2250 if hc1=7 then gosub SETNOISE
2260 if hc1=8 or hc1=9 then gosub SETP
ERIOD
2270 if hc1=10 then gosub SETCONTROLS
2280 if hc1>10 then gosub SETSHAPE
2290 return
2310 DOCHANGE:
2315 poke gintin,256:gemsys(78)
2320 if hc1<7 then gosub CHANGEVOICE
2330 if hc1=7 then gosub CHANGENOISE
2340 if hc1=8 or hc1=9 then gosub CHAN
GEPERIOD
2350 if hc1=10 then gosub CHANGECONTRO
LS
2360 if hc1>10 then gosub CHANGESHAPE
2365 poke gintin,257:gemsys(78)
2370 return
2390 SETSOUND:
2400 on hc1 goto 2410,2440,2470,2500,2
530,2560
2410 if hc2=0 then vc(1)=0:vn(1)=0:vo(
1)=0:ev1(1)=0:goto 2580
2420 vc(1)=1:vo(1)=hc2:ev1(1)=1:if vn(
1)=0 then vn(1)=1
2430 goto 2580
2440 if hc2=0 then vc(1)=0:vn(1)=0:vo(
1)=0:ev1(1)=0:goto 2580
2450 vc(1)=1:vn(1)=hc2:ev1(1)=1:if vo(
1)=0 then vo(1)=1
2460 goto 2580
2470 if hc2=0 then vc(2)=0:vn(2)=0:vo(
2)=0:ev1(2)=0:goto 2580
2480 vc(2)=2:vo(2)=hc2:ev1(2)=1:if vn(
2)=0 then vn(2)=1
2490 goto 2580
2500 if hc2=0 then vc(2)=0:vn(2)=0:vo(
2)=0:ev1(2)=0:goto 2580
2510 vc(2)=2:vn(2)=hc2:ev1(2)=1:if vo(
2)=0 then vo(2)=1
2520 goto 2580
2530 if hc2=0 then vc(3)=0:vn(3)=0:vo(
3)=0:ev1(3)=0:goto 2580
2540 vc(3)=4:vo(3)=hc2:ev1(3)=1:if vn(
3)=0 then vn(3)=1
2550 goto 2580
2560 if hc2=0 then vc(3)=0:vn(3)=0:vo(
3)=0:ev1(3)=0:goto 2580
2570 vc(3)=4:vn(3)=hc2:ev1(3)=1:if vo(
3)=0 then vo(3)=1
2580 en=vc(1)+vc(2)+vc(3)+nc(1)+nc(2)+
nc(3)
2590 gosub ENABLEENV:return
2610 SETNOISE:
2620 e=(hc2-1)*3:for x=0 to 2
2630 nc(x+1)=en1(x+e):if nc(x+1)>0 the
n ev2(x+1)=1 else ev2(x+1)=0
2640 next x:en=vc(1)+vc(2)+vc(3)+nc(1)
+nc(2)+nc(3)
2650 gosub ENABLEENV:return
2670 SETPERIOD:
2680 on (hc1-7) goto 2690,2720
2690 if pc1(hc2)=0 then pd=pd+pc(hc2):
pc1(hc2)=1:goto 2710
2700 if pc1(hc2)=1 then pd=pd-pc(hc2):
pc1(hc2)=0
2710 goto 2740
2720 if pf1(hc2)=0 then pd=pd+pf(hc2):
pf1(hc2)=1:goto 2740
2730 if pf1(hc2)=1 then pd=pd-pf(hc2):
pf1(hc2)=0
2740 if pd<0 then pd=0
2750 return
2770 SETCONTROLS:
2780 on hc2 goto 2790,2840,2860,2980
2790 sound 1,0,vn(1),vo(1),0
2800 sound 2,0,vn(2),vo(2),0
2810 sound 3,0,vn(3),vo(3),0
2820 wave en,ev,sh,pd,0
2830 goto 2990
2840 for sx=1 to 3:sound sx,0,0,0,0:ne
xt sx
2850 wave 0,0,0,0,0:goto 2990
2860 poke gintin,256:gemsys(78)
2865 gosub CHANGECONTROLS
2870 hc2=0:for hc1=2 to 6 step 2:gosub
 CHANGEVOICE:next hc1
2880 hc2=8:gosub CHANGENOISE
2890 restore 5220:x3=2:x4=3:gosub DOVB
ARNUM
2900 sh3=1:gosub CHANGESHAPE
2910 for x=1 to 3:vc(x)=0:vn(x)=0:vo(x
)=0:ev1(x)=0
2920 ev2(x)=0:ev3(x)=0:nc(x)=0:next x
2930 for x=1 to 8:pc1(x)=0:pf1(x)=0:pv
o2(x)=0:next x
2940 for x=1 to 6:pvo1(x)=0:pvn1(x)=0:
next x
2950 for x=1 to 12:pvn2(x)=0:next x
2960 en=0:ev=0:pd=0:sh=0:sh1=0:sh2=0:s
h3=0:np1=0
2965 poke gintin,257:gemsys(78)
2970 goto 2990
2980 mkey=2
2990 return
3010 SETSHAPE:
3020 on (hc1-10) goto 3030,3050,3060
3030 sh1=hc2:if hc2=1 then sh=1 else i
```

```
f hc2=2 then sh=4 else sh=8
3040 goto 3070
3050 sh=hc2+8:sh1=hc2+3:goto 3070
3060 sh=hc2+11:sh1=hc2+6
3070 return
3090 ENABLEENV:
3100 if (ev1(1)+ev2(1))>0 then ev3(1)=
1 else ev3(1)=0
3110 if (ev1(2)+ev2(2))>0 then ev3(2)=
2 else ev3(2)=0
3120 if (ev1(3)+ev2(3))>0 then ev3(3)=
4 else ev3(3)=0
3130 ev=ev3(1)+ev3(2)+ev3(3):return
3150 CHANGEVOICE:px=0
3160 on hc1 goto 3170,3250,3340,3420,3
510,3590
3170 if pvo2(1)=0 then wm=1:c1=1
3180 sx=38:gosub SETOFF:if pvo2(1)=0 t
hen goto 3230
3190 if px=1 then px=2:hc1=hc1-1
3200 x=hvl(pvo1(1)):y=vvl(pvo2(1)):asc
ii=pvo2(1)+48:tnum=1:c1=filcol1:wm=1
3210 gosub SETMODE:gosub MAKECHANGE
3220 if px=2 then px=0:hc1=hc1+1:goto
3670
3230 pvo1(1)=hc1:pvo2(1)=hc2:if hc2=0
then px=1:goto 3270
3240 goto 3670
3250 if pvn2(1)=0 then wm=1:c1=1
3260 sx=38:gosub SETOFF:if pvn2(1)=0 t
hen goto 3320
3270 if px=1 then px=2:hc1=hc1+1
3280 x=hvl(pvn1(1)):y=vvl(pvn2(1)):asc
ii=pvn2(1)+48:tnum=1:c1=filcol1:wm=1
3290 if pvn2(1)>9 then tnum=2:ascii=49
:ascii1=38+pvn2(1)
3300 gosub SETMODE:gosub MAKECHANGE
3310 if px=2 then px=0:hc1=hc1-1:goto
3670
3320 pvn1(1)=hc1:pvn2(1)=hc2:if hc2=0
then px=1:goto 3190
3330 goto 3670
3340 if pvo2(2)=0 then wm=1:c1=1
3350 sx=118:gosub SETOFF:if pvo2(2)=0
then goto 3400
3360 if px=1 then px=2:hc1=hc1-1
3370 x=hvl(pvo1(2)):y=vvl(pvo2(2)):asc
ii=pvo2(2)+48:tnum=1:c1=filcol1:wm=1
3380 gosub SETMODE:gosub MAKECHANGE
3390 if px=2 then px=0:hc1=hc1+1:goto
3670
3400 pvo1(2)=hc1:pvo2(2)=hc2:if hc2=0
then px=1:goto 3440
3410 goto 3670
3420 if pvn2(2)=0 then wm=1:c1=1
3430 sx=118:gosub SETOFF:if pvn2(2)=0
then goto 3490
3440 if px=1 then px=2:hc1=hc1+1
3450 x=hvl(pvn1(2)):y=vvl(pvn2(2)):asc
ii=pvn2(2)+48:tnum=1:c1=filcol1:wm=1
3460 if pvn2(2)>9 then tnum=2:ascii=49
:ascii1=38+pvn2(2)
3470 gosub SETMODE:gosub MAKECHANGE
3480 if px=2 then px=0:hc1=hc1-1:goto
3670
3490 pvn1(2)=hc1:pvn2(2)=hc2:if hc2=0
then px=1:goto 3360
3500 goto 3670
3510 if pvo2(3)=0 then wm=1:c1=1
3520 sx=198:gosub SETOFF:if pvo2(3)=0
then goto 3570
3530 if px=1 then px=2:hc1=hc1-1
3540 x=hvl(pvo1(3)):y=vvl(pvo2(3)):asc
ii=pvo2(3)+48:tnum=1:c1=filcol1:wm=1
3550 gosub SETMODE:gosub MAKECHANGE
3560 if px=2 then px=0:hc1=hc1+1:goto
3670
```


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CIRCLE #126 ON READER SERVICE CARD



MEGASOFT

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Thank you

Robert G. Scheffler
Software Development

MegaSoft
(206) 687-7176
P.O. Box 1080 Battle Ground, WA 98604

CIRCLE #127 ON READER SERVICE CARD

```
3570 pvo1(3)=hc1:pvo2(3)=hc2:if hc2=0
then px=1:goto 3610
3580 goto 3670
3590 if pvn2(3)=0 then wm=1:c1=1
3600 sx=198:gosub SETOFF:if pvn2(3)=0
then goto 3660
3610 if px=1 then px=2:hc1=hc1+1
3620 x=hv1(pvn1(3)):y=vv1(pvn2(3)):asc
ii=pvn2(3)+48:tnum=1:c1=filco11:wm=1
3630 if pvn2(3)>9 then tnum=2:ascii=49
:ascii=38+pvn2(3)
3640 gosub SETMODE:gosub MAKECHANGE
3650 if px=2 then px=0:hc1=hc1-1:goto
3670
3660 pvn1(3)=hc1:pvn2(3)=hc2:if hc2=0
then px=1:goto 3530
3670 if hc2=0 then wm=4:c1=filcol:gosu
b SETOFF:goto 3710
3680 x=hv1(hc1):y=vv1(hc2):ascii=hc2+4
8:tnum=1:c1=filcol:wm=4
3690 if hc2>9 then tnum=2:ascii=49:asc
ii1=38+hc2
3700 gosub SETMODE:gosub MAKECHANGE
3710 c1=1:wm=1:gosub SETMODE:return
3730 SETOFF:
3740 gosub SETWRITEMODE:color c1,1,1
3750 poke contrl,8:poke contrl+2,1:pok
e contrl+6,3
3760 poke intin,79:poke intin+2,70:pok
e intin+4,70
3770 poke ptsin,sx:poke ptsin+2,bary+(
10*mody)-2
3780 vdisys(1):return
3800 MAKECHANGE:
3810 poke contrl,12:poke contrl+2,1:po
ke contrl+6,2:poke ptsin,0
3820 poke ptsin+2,4:vdisys(1):poke con
trl,8:poke contrl+2,1
3830 poke contrl+6,tnum:poke intin,asc
ii:if tnum=2 then poke intin+2,ascii1
3840 poke ptsin,x:poke ptsin+2,y:vdisy
s(1)
3850 poke contrl,12:poke contrl+2,1:po
ke contrl+6,0
3860 poke ptsin,0:poke ptsin+2,6:vdisy
s(1):return
3880 CHANGENOISE:
3890 wm=1:c1=1:x=nh1:tnum=1:ascii=0:go
sub SETMODE
3900 y=nv1(np1):gosub MAKECHANGE
3910 ascii=8:y=nv1(hc2):gosub MAKECHAN
GE
3920 np1=hc2:return
3940 CHANGEPERIOD:
3950 on (hc1-7) goto 3960,3980
3960 if pc1(hc2)=0 then wm=1:c1=filcol
1 else wm=4:c1=filcol
3970 goto 3990
3980 if pf1(hc2)=0 then wm=1:c1=filcol
1 else wm=4:c1=filcol
3990 ascii=hc2+48:tnum=1:x=hp1(hc1-7):
y=vp1(hc2)
4000 gosub SETMODE:gosub MAKECHANGE:c1
=1:wm=1:gosub SETMODE:return
4020 CHANGECONTROLS:
4030 wm=2:gosub SETWRITEMODE
4040 if cp1=0 then 4060
4050 color 0,1,1:gotoxy cv1(cp1),(4*mo
dy)+((cp1-1)*2):?a$(cp1)
4060 color filcol,1,1:gotoxy cv1(hc2),
(4*mody)+((hc2-1)*2):?a$(hc2)
4070 cp1=hc2:wm=1:c1=1:gosub SETMODE:r
eturn
4090 CHANGESHAPE:
4100 wm=2:gosub SETWRITEMODE
4110 c1=0:if sh2=0 then 4250
4120 on sh2 goto 4130,4140,4150,4160,4
170,4180,4190,4200,4210,4220
4130 restore 5310:goto 4230
4140 restore 5330:goto 4230
4150 restore 5350:goto 4230
4160 restore 5400:goto 4230
4170 restore 5420:goto 4230
4180 restore 5450:goto 4230
4190 restore 5470:goto 4230
4200 restore 5520:goto 4230
4210 restore 5540:goto 4230
4220 restore 5570
4230 color 1,1,c1:gosub MAKESHAPE
4240 if sh3=1 then sh3=0:goto 4260
4250 sh2=sh1:sh3=1:c1=filcol:goto 4120
4260 color 1,1,1:c1=1:wm=1:gosub SETMO
DE:return
4280 MAKESHAPE:
4290 poke contrl,6:poke contrl+6,0
4300 read x:poke contrl+2,x*2
4310 for tx=0 to (x*4)-1 step 2:read x
1,y1:y1=y1*mody
4320 poke ptsin+(tx*2),x1:poke ptsin+(
(tx*2)+2),y1:next tx
4330 vdisys(1):return
4350 SETWRITEMODE:
4360 poke contrl,32:poke contrl+2,0:po
ke contrl+6,1:poke intin,wm:vdisys(1)
4370 return
4390 DOOFF:
4400 color filcol,1,1
4410 read tnum:poke contrl,8:poke cont
rl+2,1:poke contrl+6,tnum
4420 for tx=0 to tnum-1:read ascii
4430 poke intin+(tx*2),ascii:next tx
4440 for tx=1 to tnum:read x
4450 poke ptsin,x:poke ptsin+2,bary+(1
0*mody)-2
4460 vdisys(1):next tx:color 1,1,1:ret
urn
4480 SAVEHLOC:
4490 on x4 goto 4500,4520,4510,4520,45
20
4500 hv1(x2)=x:goto 4520
4510 hp1(x2)=x:goto 4520
4520 return
4540 SAVEVLOC:
4550 on x4 goto 4560,4580,4600,4610,46
20
4560 vv1(tx+1)=bary-(cellh*tx):mv1(mv)
=vv1(tx+1):mv1(mv+1)=vv1(tx+1)-5
4570 mv=mv+2:goto 4630
4580 mv1(mv+1)=bary1+(cellh*x1)+(mod1-
7):mv1(mv)=bary1+(cellh*x1)+mod1
4590 mv=mv+2:goto 4630
4600 vp1(tx+1)=bary-(cellh*tx):goto 46
30
4610 mv1(mv+1)=y1-10:mv1(mv)=y1:mv=mv+
2:goto 4630
4620 mv1(mv+1)=y2:mv1(mv)=y1:mv=mv+2
4630 return
4650 SETMODE:
4660 color 1,1,1:gosub SETWRITEMODE:co
lor c1,1,1:return
4680 WORKDATA:
4700 data 35,50,51,65,115,130,131,145,
195,210,211,225
4710 data 320,350
4720 data 397,412,413,427
4730 data 460,595
4740 data 18,118,123,223,228,328
4750 data 1,18,1,26,1,18,1,26,1,18,1,2
6,27,42,3,18,3,18,43,50
4760 data 53,58,53,58,51,58
4770 data 333,66,74,82,90,98,106,114,1
22
4790 data 8,0,0,0,16,0,0,0,32,8,16,0,8
,0,32,0,16,32,8,16,32,0,0,0
4800 data 256,1,512,2,1024,4,2048,8,40
96,16,8192,32,16384,64,32768,128
4810 data 55,55,54,57
4830 data 31,100,35,53,32,50,32,79,32,
83,32,84,32,32,83,32,79
4840 data 32,85,32,78,32,68,32,32,87,3
2,65,32,86,32,69,32,83
4860 data 3,79,70,70,38,118,198
4880 data 6,23,79,67,84,65,86,69
4900 data 4,70,84,79,78,69
4920 data 6,104,79,67,84,65,86,69
4940 data 4,149,84,79,78,69
```

```
4960 data 6,184,79,67,84,65,86,69
4980 data 4,229,84,79,78,69
5000 data 8,39,49,50,51,52,53,54,55,56
5020 data 12,52,49,50,51,52,53,54,55,5
6,57,49,48,49,49,49,50
5040 data 8,119,49,50,51,52,53,54,55,5
6
5060 data 12,132,49,50,51,52,53,54,55,
56,57,49,48,49,49,49,50
5080 data 8,199,49,50,51,52,53,54,55,5
6
5100 data 12,212,49,50,51,52,53,54,55,
56,57,49,48,49,49,49,50
5120 data 270,1,49,1,50,1,51,3,49,43,5
0,3,49,43,51,3,50,43,51
5140 data 5,49,43,50,43,51
5160 data 3,79,70,70
5180 data 6,387,67,79,65,82,83,69
5200 data 4,430,70,73,78,69
5220 data 8,401,49,50,51,52,53,54,55,5
6
5240 data 8,416,49,50,51,52,53,54,55,5
6
5260 data 10,118,160,118,172,118,184
5270 data 223,160,223,172,223,184
5280 data 328,148,328,160,328,172,328,
184
5300 data 10
5310 data 2,20,152,32,156,32,156,114,1
56
5330 data 3,20,170,32,164,32,164,32,17
0,32,170,114,170
5350 data 15,20,177,32,181,32,181,32,1
77,32,177,44,181,44,181,44,177
5360 data 44,177,56,181,56,181,56,177,
56,177,68,181,68,181,68,177,68,177
5370 data 80,181,80,181,80,177,80,177,
92,181,92,181,92,177,92,177,104,181
5380 data 104,181,104,177,104,177,114,
181
5400 data 2,125,152,137,156,137,156,21
9,156
5420 data 8,125,164,137,170,137,170,14
9,164,149,164,161,170,161,170,173,164
5430 data 173,164,185,170,185,170,197,
164,197,164,209,170,209,170,219,164
5450 data 3,125,177,137,182,137,182,13
7,177,137,177,219,177
5470 data 15,231,145,241,141,241,141,2
41,145,241,145,253,141,253,141,253,145
5480 data 253,145,265,141,265,141,265,
145,265,145,277,141,277,141,277,145
5490 data 277,145,289,141,289,141,289,
145,289,145,301,141,301,141,301,145
5500 data 301,145,313,141,313,141,313,
145,313,145,323,141
5520 data 2,231,158,241,153,241,153,32
3,153
5540 data 8,231,170,241,164,241,164,25
3,170,253,170,265,164,265,164,277,170
5550 data 277,170,289,164,289,164,301,
170,301,170,313,164,313,164,323,170
5570 data 3,231,182,241,176,241,176,24
1,182,241,182,323,182
```

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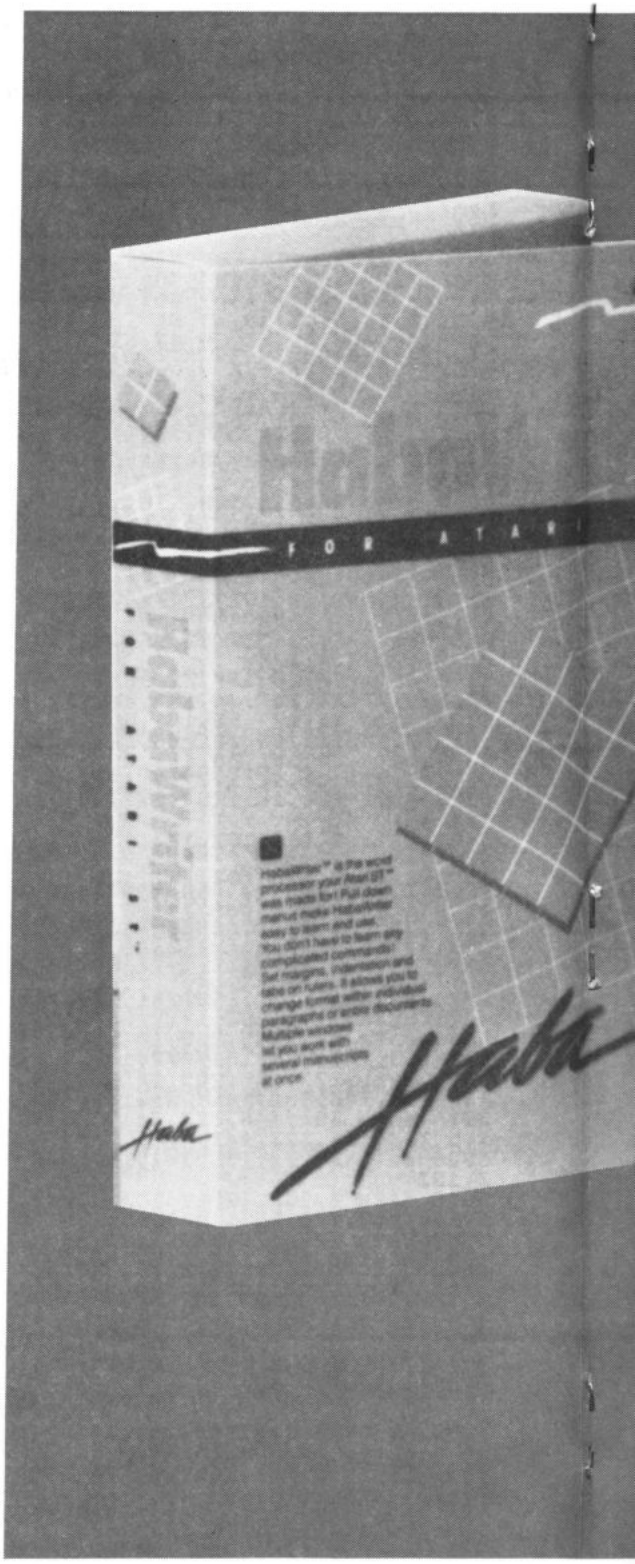
ST-CHECKSUM DATA.

(see page 58ST)

```
100 data 279,481,559,359,369,731,405,7
39,226,600,4748
200 data 698,208,863,531,781,925,304,3
92,421,953,6076
300 data 363,642,287,105,365,872,518,7
17,18,913,4800
400 data 377,482,331,395,841,315,803,3
43,744,191,4822
500 data 858,543,872,452,243,64,552,99
9,229,976,5788
580 data 615,613,338,89,693,936,995,36
1,766,364,5770
700 data 606,553,560,457,701,261,502,1
920 data 565,561,14,992,695,510,621,51
0,47,382,4897
1020 data 459,127,57,699,443,102,425,9
63,656,444,4375
1130 data 430,231,454,575,235,270,523,
336,432,812,4298
1240 data 269,228,33,391,866,432,316,8
77,60,901,4373
1350 data 174,932,424,395,15,709,923,4
40,960,190,5162
1450 data 261,590,296,648,904,413,433,
748,928,759,5980
1560 data 504,812,903,959,85,908,458,8
6,320,641,5676
1680 data 648,141,715,593,506,638,746,
89,280,991,5347
1780 data 881,403,427,439,977,612,333,
727,177,706,5682
1890 data 526,477,365,620,618,708,239,
348,358,368,4627
2000 data 503,440,679,126,475,692,778,
110,834,4,4641
2110 data 222,710,866,676,695,503,116,
837,445,446,5516
2230 data 390,418,107,203,649,105,454,
740,856,442,4364
2330 data 468,564,10,466,864,455,859,7
37,878,234,5535
2430 data 582,881,241,585,891,250,588,
887,250,584,5739
2530 data 897,260,587,900,267,368,634,
826,277,412,5428
2640 data 872,633,939,269,970,711,583,
990,735,575,7277
2750 data 465,345,844,166,165,171,821,
600,225,220,4022
2860 data 866,430,521,519,522,488,160,
426,533,585,5050
2950 data 396,976,882,607,314,475,774,
715,53,569,5761
3050 data 790,723,448,881,846,856,867,
195,656,757,7019
3170 data 750,355,891,418,710,27,695,5
81,748,354,5529
3270 data 888,417,923,712,33,695,583,7
56,399,894,6300
3370 data 437,720,37,699,584,754,407,8
91,429,931,5889
3470 data 722,43,706,586,762,430,897,4
49,723,40,5358
3570 data 710,594,767,431,894,441,939,
725,46,710,6257
3670 data 125,956,834,724,785,470,746,
475,347,99,5561
3780 data 734,980,287,626,852,564,450,
433,201,512,5639
3900 data 268,252,529,307,308,610,612,
618,984,36,4524
4020 data 683,817,542,385,825,746,144,
817,258,732,5949
4130 data 164,169,174,166,171,178,183,
168,173,52,1598
4230 data 221,922,768,169,875,358,604,
699,92,719,5427
4350 data 378,846,459,353,512,294,217,
510,580,87,4236
4460 data 272,807,133,899,888,460,834,
151,962,628,6034
4580 data 724,630,97,60,519,464,608,23
1,799,361,4493
4710 data 821,592,855,321,47,807,25,44
1,67,205,4181
4830 data 987,88,234,464,830,439,843,4
67,843,994,6189
5020 data 53,974,29,2,27,39,747,152,44
9,801,3273
5220 data 973,983,649,349,248,273,24,4
07,869,356,5131
5370 data 357,186,356,544,377,48,567,3
68,353,693,3849
5520 data 332,553,329,985,2199
```

●

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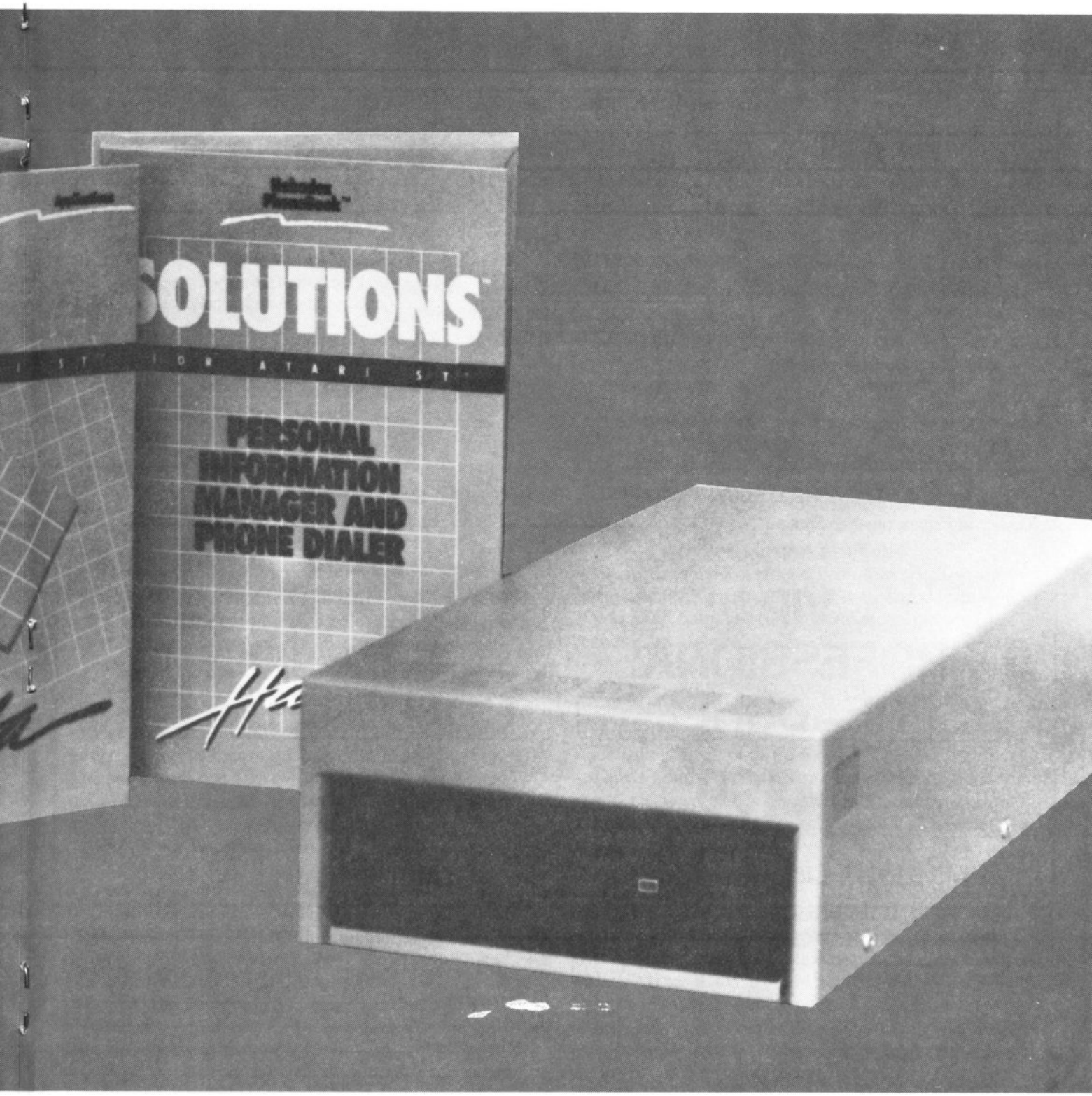
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CIRCLE #129 ON READER SERVICE CARD

C-MANSHIP

Part 4.

by Clayton Walnum

Before we get started, I'd like to thank everyone who's sent me their comments on **C-manship**. When I first started this column, I was a little worried there might not be much interest. I'm pleased to report that all the feedback has been positive, so I feel this column has a secure future.

If you were thinking of writing, but haven't gotten around to it, please do. I want to hear from you. The only way I have of knowing that I'm on the right track is from the comments I receive from you, the readers.

While we're on this subject, I got one letter of particular interest from Donald Howes, who writes:

Don't use scanf()!...To make a long story short, scanf() can develop a life of its own. It will often present you with results completely at variance with what you might have expected. This is a problem for novice programmers especially. They might be a little unsure of what they're doing and could spend needless hours trying to debug a simple program, when the problem is inherent in scanf(). It's a much better idea to develop your own input routines...

So we've been warned. Keep that in mind during your experiments with C. As I said last month, we'll eventually construct our own input routines. But for now, we'll treat scanf() with suspicion.

Our current project.

Okay, fun's over. Let's get back to work. Listing 1 is this month's program. Type it in and compile it. If you need help, see the sidebar accompanying last issue's **C-manship** article.

Feeling lucky? Good. Get out all that green stuff that's been cluttering up your wallet and give Lady Luck a wink. This month, we're all going to learn how to play craps. (I know that was top priority on your things-I've-got-to-do-today list.)

Now I admit, this isn't the most stunning version that'll cross your eyeballs, but it's a good programming exercise and demonstrates a lot of new techniques.

If you already know the rules (that's where you've been all those late nights, huh?), skip ahead to the next section. For those who've led sheltered lives, craps is a dice game which has the dubious reputation for making and breaking many a fortune. In our case, we'll try to leave your savings intact—only the rules remain the same.

Step one is to roll the dice. If, on your first roll, you get a seven or an eleven, you win. A two, three or twelve, on the other hand, leaves you the loser. If you manage to avoid all lucky and unlucky combinations, you must roll again. . .and continue to do so, in an effort to attain one of two outcomes: if you reroll your original number, you win; if you get a seven or eleven first, you lose.

The game's afoot (without toes).

Now that you know how to play, take a moment to try the program out. Have a little fun and get a general idea of what's going on.

Now let's take a look at the listing. You might want to number each line, so you can refer to them more easily as we go through the program. Remember, I don't count blank lines.

I don't think it's necessary to go through every line as we have in the past. I think you've had most of the basics pounded into your heads, right? Just notice that we've included a couple extra files (osbind.h and portab.h) this time around. You'll see why later on.

Let's skip ahead to Line 9. You've probably noticed that I usually use *ch* as a character variable. This time, I have it declared as an "int." Does that mean that I've abandoned our poor friend *ch* to a new and unknown fate? No, we're still going to use it to hold character information, because it just so happens that the only difference between a character variable and an integer is the number of bytes taken up in memory.

If you remember from a few months ago, a character is stored in 1 byte and an integer is in 2. For our purposes, the two are really interchangeable. What you should be aware of is that, in C, character variables are converted to integers for processing, then truncated back to a single byte.

By declaring them as integers in the first place, you'll always be reminded of what's going on in your machine's innards. And you may come across a time in your illustrious programming career where the difference will be critical.

Now skip ahead to Line 11. This is the beginning of the main game loop. You remember the "while" loop, right? The variable we're testing, *play*, was initialized to *1* (or true) in Line 10. As long as it retains this value, the game loop will repeat.

Notice that we aren't using the statement *while (play = = 1)*. Any nonzero value is evaluated to true, therefore *play = =1* and *play* are really the same expression. The way to test for a false condition (0) is with the not operator: *while (!play)*.

The game loop is another example of structured programming. Each major task of the program has been allotted to a function. First we roll the dice, then we check to see if the player won, lost, or has to roll again.

If the call to check_roll() leaves the variable *win* in its zero state, then the second while loop is executed. The dice are rolled until *win* changes to *1* (win) or *-1* (lose).

The variable *win* is then tested in an "if" statement, and the appropriate message is relayed to the player. The percentage of games won is calculated, and the player is asked if he wishes to play again. If he answers with a *Y*, then play remains true and the game loop repeats. Otherwise, play becomes false, and the program returns you to the desktop.

Now the details. Start with Line 11. Here we initiate the main loop. As long as the expression in parentheses is true, the loop will repeat. Since we initialized *play* to *1*, we enter the loop.

The first thing we have to do in the loop is initialize a couple more variables. This is important, since the values of *first* and *roll* are passed to the function that "rolls" our dice.

The variable *first* is used as a flag to indicate if it's the player's first roll. What roll we're on is important. For example, a seven on the first roll is a winner. A seven on the second roll is a loser. The variable *roll* will hold the value of the current roll (except the first one). Line 14 is to call the function roll_dice() and places the value returned in *first_roll*.

Line 15 calls check_roll() and places its return into *win*. In order to evaluate the player's roll, this function needs some information. We're passing the information by giving it the values of first, first_roll and roll.

Line 16 changes the flag *first* to its false condition. If the player neither won nor lost with his first roll, then the value of *win* will still be *0*, and the second while loop, which begins on Line 17, will be performed.

See the *win = =0*? Why didn't I use the *while (!win)* construction as mentioned previously? There's really no reason, as far as the program goes. I used the former construction to make the program more readable. Using *!win* might make someone looking at the source code think that if *win* was *0* the player lost. This isn't true. A value of *0* means that the player hasn't won *and* he hasn't lost. It's a neutral state. If you want to use *!win*, go right ahead. It'll work just fine.

Line 19 calls roll_dice() a second time. This time, it assigns the value returned to the variable *roll*. We need this second variable, since we need to compare the first roll with all subsequent rolls.

Line 20 calls check_roll() again. If the value of *win* remains *0*—meaning the player still hasn't either won or lost his turn—the loop repeats. Once the player has managed to make his roll—or has blown it, with a seven or eleven—we exit the loop.

Line 22 will increment the game counter, *num_games*. We'll use this value to calculate the percentage of games won.

Lines 23 through 29 make up the body of an "if" statement. It uses the value contained in *win* to print the appropriate message to the player, as well as keep track of the number of wins.

If *win* is *-1*, the player has lost, and the program prints *You lose*—deep, huh? If *win* equals *1*, the player has won the game, and a statement of equal profundity is printed (sigh).

Also, the counter *num_win* is incremented, keeping track of the number of games our lucky player has managed to be victorious in. We're also calling a new library function here, *puts()*. This function is going to print the string argument contained in the parentheses. The main difference between the two, puts() and printf(), is that the former has no formatting options.

Last month, we just touched on the format of the "if" statement. This month, we're going to look at some much more complex examples. The statement we're looking at now is a slight variation of the one we saw in the last installment. The difference is the addition of the *else* portion.

Thinking back, you'll remember that the body of an "if" statement is performed only when the expression in the parentheses is true. When you add the *else*, the rules change just a bit. You now have a kind of "either/or" condition. If the expression being tested is true, the statements following the *if* and preceding the *else* will be performed. If the expression tested is false, the statements associated with the *else* are performed.

The syntax rules for the *else* are the same as for the *if*. If the body of the *else* portion consists of more than one statement, you must enclose them in brackets, and—remember—each statement must end with a semicolon.

Line 30 calls the function percent()—which prints out the percentage of games won.

Line 31 calls the function play_again()—to find out if the player wishes to continue or quit.

Digging deeper.

Now that we've taken a look at the general scheme of things, we can get into the details of each function.

The function roll_dice() does exactly as its name implies. The first thing you should take note of is the way this function is declared. There's something extra here. See what it is? Up till now, our functions have been declared simply by the function name.

Now the key word *int* has been added in front of the name. This specifies that the value to be returned by the function will be an integer. In this case, we could have left it off, since the default is always an integer.

But, if we wanted to return some other data type from a function, we *must* declare the type in the function definition *and* in the calling function. For instance, if we wanted to return a character from a function named ret_char(), we would first declare the function type in the calling function like this:

```
main()
{
   char ret_char();
```

Then the function declaration might look like this:

```
char ret_char(l, b)
int l, b;
```

The variables *l* and *b* are the values being passed to the function, and are included here only to differentiate between the two examples.

Lines 36 through 39 declare some local variables, print a prompt, and wait for a key press.

Line 40 gets a random number and places it in *d1*. Random() is a function specific to the ST and is an extension of the BIOS (Basic Input/Output System). It returns a 24-bit random number.

In our case, we need an integer. Take a good look at Line 40. See the *int* in parentheses? This is a "cast operator." What we're doing is forcing the return of Random() into a 16-bit integer, rather than doing it implicitly through automatic conversion (just leaving the cast operator out). In this particular case, the statement would've worked either way, but sometimes the difference can be critical.

Look at these two code segments:

```
int i;
i = 3.4 + 7.8

int i;
i = (int) 3.4 + (int) 7.8
```

In the first example, the addition is performed, yielding a result of *11.2*. Then, since the variable *i* is defined as an integer, the conversion from *float* to *int* is done automatically by trucation, making *i* equal to *11*.

In the second example, *3.4* and *7.8* are converted to integers before the addition is performed. This yields a result of *10*. Not quite the same answer.

Line 41 takes the value in *d1* and converts it to a positive number between 1 and 6, using modulo arithmetic and the absolute value function.

The abs() function is defined in the stdio.h file. It

looks and works exactly the way you've grown accustomed to in BASIC, returning the absolute value of a single argument.

The percent sign is the modulus operator. It is used only in integer arithmetic and yields the remainder when the number on the left is divided by the number on the right. For example, the expression 6 % 4 gives a result of 2.

So, in Line 41, we're taking the absolute value of *d1* (in case we got a negative number from Random()), dividing it by six, then adding one to the re- ler. Using six in the modulo math assures us always get a remainder less than six (zero ough five, to be exact). Adding one gives us our ll of the die (one through six).

Lines 42 and 43 get a value for the second die in the same manner.

The function then prints out the value of each die, as well as the total. The total (*t*) is then passed back to main().

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Atari ST

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Line 50 declares the function check_roll() as returning an integer. Three values are being passed to the function. Notice that the variables being passed (Line 15) and the variables that are accepting the values, have the same names. This is purely for reasons of clarity. They're still completely separate identities.

Now look at the body of the function. This is surely the most complex piece of code we've tackled yet. Basically, the whole thing is an "if" statement, but with layer upon layer. This function will give you great insight into the problems inherent in nested "if" statements.

Before we get too far into this function, I should introduce you to the *else if* construction. I mentioned previously that, with the "if...else" statement, we have an either/or situation. The *else if* takes this one step further, and allows us to add a test to the *else* portion of the statement. Look at this example:

```
if (exp1)
    statement1;
else if (exp2)
    statement2;
else
    statement3;
```

If exp1 is true, statement1 will be executed and the *elses* ignored. If exp1 is false, then exp2 is tested. If we get a true result, statement2 is executed and the final else is ignored. Finally if both exp1 and exp2 are false, statement3 is executed.

In check_roll(), we're using the flag variable *first* to decide which set of "rules" apply to the player's roll. If it's his first roll, *first* will be equal to 1, and we'll go ahead and evaluate the second "if" statement, which checks to see if the roll was a seven or an eleven. If it was, the player wins. The flag *wn* is set to 1, and program execution continues at Line 66.

See those vertical bars in the middle of Line 57? That's the *or* operator. Line 57 reads: *if first_roll equals seven or first_roll equals eleven*. The *or* operator yields a true result if one or more of the expressions are true. Here are a couple of examples. . . If we assume that *a* equals 1, *b* equals 2, and *c* equals 3, then following expressions evaluate as shown:

```
a==1 || b==6                 TRUE
a==4 || b==2                 TRUE
a==1 || b==2                 TRUE
a==2 || b==5                 FALSE
a==3 || b==3 || c==3         TRUE
a==1 || b==5 || c==3         TRUE
a==2 || b==3 || c==4         FALSE
```

Continuing with check_roll(), if the roll wasn't a seven or eleven, we evaluate the *else if* portion of the statement. Here we check for a 2, 3 or 12. If we find one of these values, the player loses.

The flag *wn* is set to *-1*, and, as in the first case, program execution continues at Line 66. If neither of the previous conditions are true, *wn* retains its initialized value of *0* (Line 54), and, once again, the program continues at Line 66—which returns the value of the flag to main().

Whew! All that's only if the player's on his first roll. If *first* is *0*, program execution jumps to the "else if" statement on Line 62.

Before we continue, I'd like to see if I can help you avoid a good deal of teeth-knashing and hair-pulling in your future C programming. Look at those brackets on Lines 56 and 61. They're absolutely essential with nested "if" statements containing else constructions.

Without those brackets, the compiler has no way of knowing that the last two "else if" statements go with the outer "if" and not the inner. Keep in mind that the indenting is only cosmetic; it means absolutely nothing to the compiler. This is an easy trap to fall into, since the indenting makes everything so clear to the programmer.

Now let's take the second possible path in this function. If *first* is *0*, all the stuff between the brackets is skipped, and we continue at Line 62. This line checks to see if the player's roll was equal to his first. If it was, *wn* is set to *1* (win), and its value is returned to main() at Line 66.

If the first condition isn't true, we drop down to test the second. Line 64 checks for a roll of seven or eleven. If it evaluates to true, *wn* is set to *-1* (lose) and its value is returned at Line 66.

If none of the above conditions are met, the only thing that happens in this function is *wn* is set to *0* (Line 54) and its value is returned to main() (Line 66). The player has neither won nor lost, and must roll again. This process repeats until *wn*—and, subsequently, *win*—gets a nonzero value.

Moving on, Line 68 defines the function percent(). The word *VOID* in front of the function name indicates to the programmer that the function doesn't return a value. Like the *int*, it could've been left off.

VOID is defined in portab.h, which we included at the beginning of the program, and is really just an empty comment. In other words, even though we've declared percent() as *VOID*, it's still capable of returning an integer value. We're declaring it this way for the sake of clarity only.

This function does nothing more than calculate the percentage of games won and print the result out to the player. A few things should be said about Line 72, though.

First of all, in case it isn't obvious, the "/" (not to be confused with "\") is the division operator. The value on the left of the operator is divided by the value on the right.

You'll notice that the integer variables *num_win* and *num_games* are being cast to floating point. This is critical in this calculation. When you divide integers in C, you get an integer result; the decimal portion is truncated. If we allow this to happen with our percent calculation, we'll get two possible results, only one of which will be accurate. If we've won every game, then *num_win/num_games* will give us *1*, which multiplied times *100* equals *100%*. Fine and dandy.

But what happens if we've only won one game out of two? In integer division, *num_win/num_games* will give a result less than *1*. When the decimal portion is truncated, we'll end up with *0*. And what's *0* times *100*? It's certainly not *50%*, the result we want.

Okay, we're almost done. Just one more function to take a look at. The function play_again() is responsible for finding out if the player wants to play another game. There's really nothing very new here. Something that we had a brief encounter with was the way we're using getchar() in Line 80. We could rewrite this line as follows:

```
ch = getchar();
if (ch == 'Y' || ch == 'y')
```

One of the neat things about C is the way you can cram a lot of stuff on one line. Here, getchar() is called and its value is compared to the character *Y*. The variable *ch* now contains the value returned by getchar(), and it's compared to the character *y*.

If either of these compares finds a match, then the flag *p* is set to its true condition and returned into play, to be evaluated at Line 11. This way, the game repeats until the call to play_again() results in a *0*.

Breathing time.

That's it—class dismissed. If any of the program is still fuzzy to you, study up on it, especially the function check_roll(). When you feel you've got it all down pat, try your hand at writing a simple game.

How about that classic guess-the-number game? It should be fairly easy. Have the computer pick a random number between 1 and 100. As the player tries to guess the number, have the computer tell him whether he's too high or too low.

As for me, C you later. (Sorry about that.)

(Listing begins on next page)

```
#include <stdio.h>
#include <osbind.h>
#include <portab.h>

main()
{
   int first_roll, win, roll, play, first;
   int num_win = 0;
   int num_games = 0;
   int ch;

   play = 1;  win = 0;
   while (play)
      {
      first = 1;  roll = 0;
      first_roll = roll_dice();
      win = check_roll (first, first_roll, roll);
      first = 0;
      while (win == 0)
         {
         roll = roll_dice();
         win = check_roll (first, first_roll, roll);
         }
      ++num_games;
      if (win == -1)
         puts("You lose.  ");
      else
         {
         ++num_win;
         puts("You win!  ");
         }
      percent(num_games, num_win);
      play = play_again();
      }
}
int roll_dice()
{
   int d1,d2,t;
   int ch;

   puts ("Press space bar to roll\n");
   ch = getchar();
   d1 = (int) Random();
   d1 = abs(d1) % 6 + 1;
   d2 = (int) Random();
   d2 = abs(d2) % 6 + 1;
   printf ("Die #1: %d      ", d1);
   printf ("Die #2: %d\n\n", d2);
   t = d1 + d2;
   printf ("Your roll: %d\n\n", t);
   return (t);
}

int check_roll(first, first_roll, roll)
int first, first_roll, roll;
{
   int wn;

   wn = 0;
   if (first == 1)
      {
      if (first_roll == 7 || first_roll == 11)
         wn = 1;
      else if (first_roll == 2 || first_roll == 3 || first_roll == 12)
         wn = -1;
      }
   else if (first_roll == roll)
         wn = 1;
   else if (roll == 7 || roll == 11)
         wn = -1;
   return (wn);
}

VOID percent (num_games, num_win)
int num_games, num_win;
{
   float pc;
   pc = ((float) num_win / (float) num_games) * 100.0;
   printf ("You've won %d %% of the games\n", (int) pc);
}

int play_again ()
{
   int p;
   int ch;

   puts ("Play again? ");
   if ((ch = getchar()) == 'Y' || ch == 'y')
      p = 1;
   else
      p = 0;
   puts ("\n\n");
   return(p);
}
```

Word Processing on the Atari 520ST

by Arthur Leyenberger

The 16-bit Atari ST has been available to the public for nine months now, and there's no denying its success. The reason for its popularity is largely due to the amount of software available for the machine.

There's no category of software more widely used than word processing programs, regardless of which computer we talk about. This applies to the Atari ST, as well. Fortunately, there are plenty of programs to choose from, as you'll soon discover.

The business of processing words is relatively straightforward on most computers. Sure, some programs offer a few more features here, or an easier-to-use command set there, but, for the most part, if you've seen one word processor, you've seen them all.

However, with the introduction of computers like the Apple Macintosh—and now the Atari ST with its GEM interface—the business of processing words has, at least potentially, been made easier.

There are five word processing programs for the ST, which can be categorized as either "text-based" or "GEM-based." Text-based programs function like about any other word processor on any computer; they display only text on-screen. They typically require you to use commands or respond to menus, in order to edit, format and print your documents.

The GEM-based programs use the natural interface of the GEM desktop, with its icons, drop-down menus, windows and mouse control. The mouse may seem awkward at first. Some people claim that, since using a mouse requires that your hand leave the keyboard, it takes more time to use the mouse than it saves.

However, with a well-designed set of commands, a word processor that allows use of a mouse can be *easier* than a text-based program. After a couple hours of mousing around, most users find that they're accustomed to manipulating the mouse—it eventually becomes quite natural.

Text-based word processors.

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ST-Writer is an all-text word processor, based primarily on the highly-rated **AtariWriter** for the 8-bit computers. **AtariWriter** has been around for a couple years now and has proven itself with many 8-bit owners. Anyone familiar with the program will find **ST-Writer** easy to slip into, comfortable as an old pair of slippers.

Instead of using the START, SELECT and OPTION keys of its predecessor, **ST-Writer** takes advantage of the ten function keys located across the top of the keyboard. The ESC, CTRL and ALTERNATE keys are also used, either individually or in conjunction with one of the function keys. Of course, the major difference is the eighty columns of text across your RGB or monochrome monitor screen.

On a color monitor, the control codes (used for special printer codes, end of paragraph carriage returns and option settings) are easily found, displayed in red. At the top of the **ST-Writer** screen is the command line, with red letters and white numbers. The screen is clear, too, with text in white on black—or the reverse, if you like.

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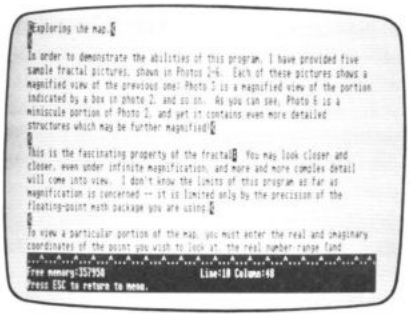
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disk; print to either the screen, a disk file or a printer; and receive files directly transmitted from an 8-bit Atari.

In the edit screen, the number of free memory is always displayed—over 150-thousand bytes free with RAM TOS, or over 350-thousand free bytes with TOS on ROM. Further, you can mark blocks of text and save them to disk.

There are other ST-specific features worthy of note. The program allows you to use files located in subdirectories, on any disk, and it automatically keeps track of which directory you're looking at when doing a file save or a disk index.



ST-Writer.

ST-Writer is a what-you-see-is-what-you-get word processor. You can, therefore, see on-screen how single- or double-column formatting will look before you print it out. . . a very useful feature.

Documentation consists of several files as freely available as is the program itself. There are tutorial, reference, quick reference and function key label files available.

In addition, a couple of other files are needed before the program can be effectively used. There's a configuration program that uses a specific configuration file to create the "XYZZX" printer driver file that **ST-Writer** looks for when told to print. If you're familiar with ASCII printer control codes, you can modify the source driver file so that **ST-Writer** works with your non-Epson-compatible printer.

ST-Writer contains just about every feature most users would need. There are a few commands not offered—like ability to move the cursor from word to word or paragraph to paragraph, the ability to delete a word or paragraph at a time, or the capability to use multiple windows for text.

And there are a few problems with **ST-Writer**. For example, cursor movement is slower as your file gets bigger. There's a lengthy conversion time required to import a non-**ST-Writer** file. For a seemingly small file, it can take a couple minutes for the screen to return to normal.

There are also a few bugs that mysteriously lock up the computer at times—and, just as mysteriously, have no effect at other times.

One of the bugs rears its ugly head when you try to print double-column output. It seems, when a carriage return occurs at the end of a paragraph in the left column, the right column margins get out of sync. Another bug prevents you from blocking the headers flush against the right margin. In fact, I've had some problems trying to print headers in general.

ST-Writer appears a reasonable choice for a word processor, considering its price and availability. Unfortunately, Atari's limited resources will probably prevent them from correcting bugs or adding features regularly. So, although it's free, you must decide if you want to trust your important word processing work to a program which Atari has no stake in maintaining or improving.

Regent Word.

While various versions of **ST-Writer** were making the rounds, **Regent Word** appeared on the scene, an easy-to-use but powerful word processor. **Regent Word** is from the same folks who developed **AtariWriter** and **AtariWriter Plus**—Regent Software.

The program is billed as the first full-function word processor for the ST computer. It was surely one of the first and is clearly full of features.

Regent Word is menu driven and will work on either a monochrome or RGB monitor. One of its key features is the built-in "help" function. By pressing HELP on the keyboard, the user can display one of five menu screens at any time. Pressing the SPACE BAR cycles through the menus, and the UNDO key exits the menus.

The multiple menus in **Regent Word** aren't menus *per se*. Rather, they're help screens that tell you what the commands are. Since most commands are invoked by a single keystroke, the complexity of help menus and commands is not burdensome.

Commands are issued by a variety of two-key presses with the ALTERNATE, CTRL and ESC keys. Also, function keys across the top of the keyboard have been defined for block operations.

Like other ST word processors, **Regent Word** offers 80-column editing and the usual. The RETURN key is used only at the end of a paragraph; word wrap occurs at the end of each line; and DELETE and BACKSPACE work as expected.

The cursor can be positioned throughout text by a character or screen at a time. In addition, you can move directly to the top or bottom of the text with one command.

The print preview function shows how your underlined, elongated and bold print will look before you actually print it. Super- and subscripts, headers, footers, justification and page numbering are also supported.

Much like **AtariWriter** word processors, **Regent Word** allows you to access all the features of your printer control codes and options. Using CTRL and various letters, such attributes as line spacing, print style, centering, headers/footers, margins and justification can be set. In addition, specific ASCII printer

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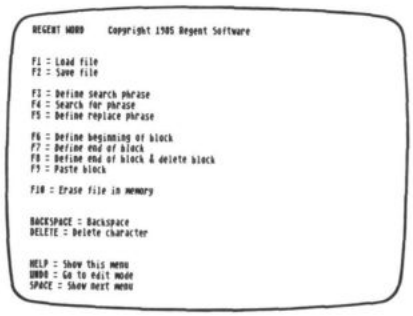
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codes can be sent directly to the printer from anywhere in the document.

A number of features in **Regent Word** are especially useful and well implemented. When the program's first run, you're asked to enter the date and time. Given the lack of battery backup and the unreliable clock in the ST, this feature ensures that any files created or edited with **Regent Word** will have the correct date and time stamp. During editing, the time is continually displayed at the top of the screen.

When loading a file, all files on the current disk are displayed on-screen, with a letter next to each. Pressing the letter corresponding to the file you want will load that file into memory. In addition, the directory also shows total storage available on the disk, plus creation dates and sizes of individual files.



Regent Word.

Another useful **Regent Word** feature is its ability to give you a word count of the file currently in memory at any time. The program also has a built-in communication feature, allowing documents to be sent or received via the communications port on the ST.

Currently, **Regent Word** is designed for Epson dot-matrix printers (or compatibles) and the Juki letter-quality printer. The program will use however much memory is available (an Atari 520ST with TOS in ROM yields almost 400K free for text files). Also, the size of the document does not affect cursor speed.

Copy protected **Regent Word** sells for $50. Fortunately, a backup disk can be ordered in either single- or double-sided versions for only $5.00. Still, there's no way to put this word processor on your hard disk. Overall, **Regent Word** is a powerful, easy-to-use, text-based word processor, just as advertised.

Regent Software also has a product called **Regent Spell**, a 30,000-word spelling checker that can be used with **Regent Word** or other word processors. As carefully designed and thought out as **Regent Word** is, though, **Regent Spell** seems the opposite. Perhaps it was rushed to market.

It's not that the program has bugs. On the contrary, it's fast and seems bug-free. The problem lies with the number of small irritations and feature omissions.

For example, there's no way to quit a spelling check before the program has reached the end of the file. And, since there's no word count or visual indication of progress, you have no idea how long the check will take.

Further, there's no display of the filename and no method to return to the last word checked. **Regent Spell** is a one-way program. There's no mass dictionary update, to let you take a file you know is good and have it added to the program's list of words.

Finally, although you can use some features of the program from the mouse, you must leave the mouse and press RETURN after clicking on INSERT or DELETE.

Regent Spell sells for $40 (from Regent Software, 7131 Owensmouth, Suite 45A, Canoga Park, CA 91303 — (818) 883-0951) and is copy protected. As it stands now, the program works, but the number of irritations makes it difficult to use. In discussing these problems with Regent Software, I was assured that most (if not all) of my complaints would be incorporated into the next version of the program.

I have no reason to doubt their word. If these and a few other minor changes are made, **Regent Spell** could well be the *de facto* spelling checker for the ST.

Final Word.

It's somewhat difficult to describe Mark of the Unicorn's **Final Word**. Frankly, I don't know where to start. The program's a sophisticated word processor that'll probably require a substantial hunk of time to master. But, having digested the tome-length documentation, you'll find yourself amazed by the power at your word processing fingertips.

Final Word comes with almost 500 pages of documentation accompanying the two single-sided program disks. Part of this is a 150-page tutorial that must be followed chapter by chapter if you expect to get anywhere past turning on your ST.

In addition, a terse, 4-page installation guide tells you how to get this program up and running. The only specific reference to the Atari ST occurs in this little guide. As with the PC version (the original), the whole kit and caboodle comes in an attractive black slipcase.

One of the unique aspects of **Final Word** is that it's crashproof. Unlike other word processors, where you *could* lose your work, **Final Word** automatically saves your work into a buffer file whenever you stop typing for a period of ten seconds. If your computer loses power, all you've lost is ten seconds' work.

Another feature is split-screen editing. With a single command, you can split the screen into two parts. And, since **Final Word** can edit up to twelve documents at once, you could display parts of various files in one window, while editing your document in the other. Or you could keep a rough draft in one window as you polish off the final version in the other. Text can easily be copied or moved between windows.

Final Word is really two word processors in one. Either may be chosen, based upon the needs of the task at hand. The on-screen Editor is a what-you-see-is-what-you-get word processing editor. You type and edit the text on-screen, and it appears exactly as it will on the final, printed copy.

The other editor, called the Advanced Formatter, allows you to specify how your finished documents will look, by including formatting commands in the body of the document.

These commands are inserted into the document as you type and edit, but you'll only see how it looks when the document is printed. With the Advanced Formatter, you can produce serious writing, including table of contents, index and footnotes.

Final Word contains a series of menus, grouped into a main menu and ten function menus. The main menu lists all submenus. When displayed, it partially obscures your text. After you're familiar with the program, you can turn the menu feature off.

After a brief exposure to **Final Word**, you'll get used to seeing the message *swapping*, which occasionally flashes at the bottom of the screen. When this message is displayed, the program is copying the text from memory into a disk file called the "swap file."

Swapping is automatic whenever you stop typing for ten seconds. You can change the time interval to suit your needs. It's this swap file that contains your text—when the power fails, the

computer crashes, or you forget to save a file. Should you need to retrieve lost text, a recover program is run to re-establish where you left off.

Final Word is truly a powerful program. For the power writer, or someone who needs sophisticated word processing features, this one should be sufficient.

Some of the program's heavy duty features include: precise control of headers and footers; the ability to place footnotes at the bottom of each page, at the end of the document or embedded in the same line as their reference; automatic chapter, section and "new page" formatting controls; the ability to create lists, numbered or not, within the body of the text; and the ability to create a table of contents and index.

The **Final Word** tutorial is what makes this complex program manageable. Although a little chatty at times, it uses good training techniques—beginning each section with a list of objectives, providing plenty of examples during the tutorial, then summarizing what was learned at the end of the section. The reference manual is complete, too.

There are a few flaws that you should be aware of. The program is copy protected. You can run it from a copy, but one of the two original disks (used as a "key disk") must be in drive A whenever you start up. Fortunately, the ability to change just about every parameter and option of the program allows you to put the multitude of necessary programs on a double-sided disk or, better yet, a hard disk.

Another problem: for all its power, **Final Word** does not allow double-column printing. Newsletter editors should look elsewhere if that's a major requirement. Further, the manual assumes you're working on a CP/M or MS-DOS system. For the uninitiated, this could be a little confusing.

Probably the most serious weakness in the program is the extremely tedious setup—and the sheer number of program files. To get to the point where you can just type one word from within the program requires a seemingly endless checklist. And heaven forbid you should need to recover a file. The first few times you try to run "recover," you'll be quivering in your boots.

Final Word sells for $125 and works with a variety of dot-matrix and letter-quality printers. Although it can be used with a single disk drive, the less patient Atari ST user will opt for two drives or a hard disk.

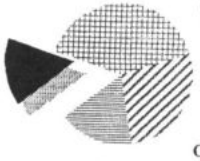
If you need the word processing power to go along with your "Power without the Price," **Final Word** is the only current alternative. It's available from Mark of the Unicorn, 222 Third Street, Cambridge, Ma 02142 — (617) 576-2760.

GEM-based word processors.

HabaWriter is the first GEM-based word processing program for the Atari ST. All the features of the GEM interface—like drop-down menus and mouse control of the cursor—are available.

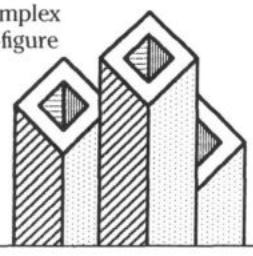
However, the first release of the program, version 1.0, was somewhat "bug

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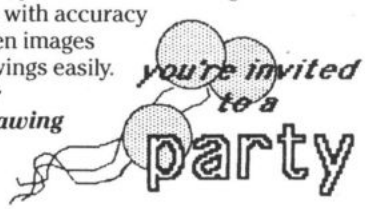


There is a difference between paint and draw programs. Paint programs are recreational packages that allow freeform painting on a dot-by-dot basis. With each new stroke you obliterate everything you cover. And erasing permanently removes everything you've created.

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gy." Files were occasionally lost, the screen froze, and the cursor tended to disappear. Fatal bugs have been eliminated in version 1.1 and a number of enhancements made to the program. This review is based on version 1.1.

HabaWriter is copy protected, but you can copy the program files to another disk. As long as the original disk is in drive A when you start the program, it will start. . .then you can remove the original "key disk."

When the program begins, a familiar GEM window appears on-screen, with a menu bar across the top. Desktop accessories are available under the "desk menu," assuming the .ACC files were on your disk when you first booted up your ST.

The menu bar contains **HabaWriter** commands, and each menu has related commands. The menus labeled File, Edit, Search, Format, Style and Print are all descriptive of commands they contain, and everything is logically laid out. The function keys on the ST keyboard can also be used to select commands.

The **HabaWriter** document window is a regular Atari ST window. You can change its size, move it around the desktop and close it by clicking on the close box.

You can also use the vertical and horizontal slider bars to move throughout the document currently in the window. Up to six windows can be open at a time, and there's a clipboard for cutting and pasting parts of (or entire) documents.

To load a previously created file, the user selects the "open" command from the File menu. A GEM file selector box appears, and a file can be chosen, or the drive and directory can be changed.

As the file loads, a small, square box much like a meter appears on-screen, showing the progress of reading the file.

HabaWriter lets you work with many documents at once. The procedure for opening another existing document is as described above, or you can create a new document.

The multiple window technique is very handy for taking notes while you're writing. As you think of ideas you want to save, you can click on your other window, type your thoughts and return to the spot where you left off.

You can copy or cut and paste text between or within documents. Once the text is highlighted, by dragging the mouse from start to end, the block can be moved directly to another location or document, or to the clipboard. An entire file can also be pasted into a document.

The document format can be set, changed and even saved with the file. Each time the document's loaded in the future, settings will be loaded along with the text.

Margins, indentation, justification, type styles, tabs and preferences can all be specified. **HabaWriter** supports ASCII or "word processing mode" files, and sub- and superscripts.

There are a few features **HabaWriter** version 1.1 lacks. Currently, there's no way to change the line spacing to anything other than single-space mode. Headers and footers aren't supported. There are no fonts at this time—just underline, bold and normal text.

The program has trouble reformatting paragraphs or documents in ASCII mode. In fact, the feature only works properly in "HabaWriter" mode on text entered with the program. The Search and Replace function can't handle ASCII characters like carriage returns (CTRL-M).

The DELETE key on the ST keyboard does not work (frustrating!), and, finally, there's no index in the 46-page manual.

On the positive side, Haba is making an effort to produce quality software. Version 1.1 of the program corrected earlier bugs and added features, such as the ability to create your own printer configuration file, the ability to send ASCII printer codes to the printer, and sub- and superscripts.

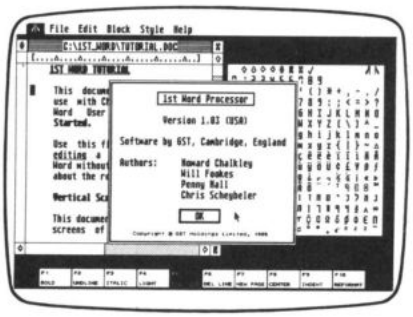
I'm told that version 1.2 of **HabaWriter** will have variable line spacing, headers and footers, and multiple printer configuration files on the distribution disk.

I'd also like to mention Haba's on-line support on CompuServe. Gerry Humphrey from the product development staff is very active on the 16-bit SIG (pcs 58).

Not only does he answer all questions courteously, but he's interested in feedback on this and other Haba products, so they can be enhanced to give you the best products possible. If you have any questions, suggestions or complaints on **HabaWriter**, leave Gerry a message. He'll get back to you quickly.

The on-line customer support provided by Haba is another indication that Haba wants to be your word processing company. I don't know of any other company currently marketing a word processor for the Atari ST which provides this level of support. Given the current version of the program and the planned changes, **HabaWriter** could easily become *the* ST word processor for a lot of people.

HabaWriter works in either high or medium resolution on the ST. The program lists for $80, and Version 1.2 should be available by the time you read this. Existing owners can receive an upgrade by sending $7.50 and their original disk to Haba Systems, 6711 Valjean Avenue, Van Nuys, CA 91406 — (818) 901-8828, attention Technical Support.



1st Word.

1st Word is a GEM-based word processor developed by GST Holdings, Ltd., an English company. The program was originally provided free by Atari for ST purchasers during the Christmas 1985 season. It's now sold separately for $40 and is still being marketed by Atari Corp., 1196 Borregas Avenue, Sunnyvale, CA 94086 — (408) 745-2021.

Like **HabaWriter**, **1st Word** takes full advantage of user-oriented GEM features like drop-down menus, icons and windows. Editing tasks, such as cut and paste or changes in document layout and style, can be performed with the mouse. The documentation consists of a 42-page file on the program disk.

1st Word isn't copy protected, so it can easily be placed on the higher capacity, double-sided disks or a hard disk. The program works in low, medium and high resolution, but only medium- and high-resolution screens will provide you with 80-column text format.

A number of files come on the distribution disk. In addition to the **1st Word** program and resource file, there's a program called 1st Print, to allow you to print while using **1st Word**. You can't print a file while there's an open window on-screen, though. Trying to run

the printer program from the GEM desktop will not work.

There's a user guide file and short "tutorial file" that's nothing more than a short example. Three printer drivers—Epson, Qume and plain ASCII—are included on the disk.

In addition, an install program's available, to let you create the necessary printer driver file after you've edited the hex source file. This program creates either a .DOT or a .DSY file, for use with dot-matrix or daisy-wheel printers, respectively.

The operation of **1st Word** is quite similar to that of **HabaWriter**, with a couple notable exceptions. In addition to the menu bar at the top of the screen, which contains various commands in separate drop-down menus, there's a set of function key icons across the bottom, to indicate the word processing functions assigned to each function key.

Keys F1 through F5 indicate toggle settings of bold, underlined, italic, light and insert mode. The other five keys perform actions when editing: line deletion, new page, line centering, and paragraph indenting and formatting.

A particularly useful feature of **1st Word** is that these function keys can be operated either from the keyboard or by clicking the mouse on the appropriate key icon.

Another significant difference between **HabaWriter** and **1st Word** is the font table on-screen, partially obscured by the primary GEM window. This table holds the ST character font, which may vary from country to country. Since not all the ST's 256 characters are available from the keyboard, this table allows you to select any character you want, simply by clicking the mouse on the correct position.

1st Word will copy that character to your window at the current cursor position. This font table is only available in medium and high resolution.

There are a few things I *don't* like about **1st Word**. . . Like **HabaWriter**, it only lets you single-space documents. The program also has problems reformatting text from an ASCII file. And there's a silly page eject each time you print a document, which can't be surpressed . There are no extra fonts (like Macintosh uses) available for the program.

On the favorable side, **1st Word** allows the use of headers and footers, although they can only be one liners. The program supports page numbering, conditional page breaks, the use of position markers, and cut and paste operations. As mentioned before, it's not copy protected, so it can easily be backed up and installed on a hard disk.

1st Word is an easy-to-use and capable word processing program for the Atari ST. I'm sure we'll see more sophisticated GEM-based word processors become available, but, until then, **1st Word** will let you do a lot of writing.

GEM Write is a word processor for the ST, which has been promised since the ST was first announced. Atari said that several GEM programs would be available when the computer hit the streets in the summer of 1985. Similar to the Apple Macintosh, which comes with a decent word processor and drawing program, the ST was to arrive with some software. But, somewhere between there and here, the GEM programs got waylaid.

For the last several months, I've been repeatedly asking *both* Atari and Digital Research when we could expect **GEM Write** and **GEM Draw**. Both have been available for the IBM PC market for quite a while.

The response I get from either party is the same—it's the other guy who's holding things up.

If you believe the scuttlebut, Atari wants to pay a lower price than they first agreed to (seems believable). And DRI wants Atari to pay them for some other stuff, before they turn over the programs (also believable).

The debate won't be settled here. Having used **GEM Write** on a PC, and assuming that it'll appear for the ST *sometime*, I thought it would be appropriate to give it a brief mention here.

GEM Write looks like **HabaWriter** and **1st Word**, but isn't as functional. Sure, it uses a mouse and windowing environment like the others, but it allows only one open window at a time. You can't do something as rudimentary as mixing formats to produce, say, a single-spaced paragraph in a double-spaced document. Also, there's no way to pass control codes to your print or delete files from within the program.

GEM Write allows you to use either drop-down menus or CTRL-key sequences for issuing commands. The latter are very similar to those used by **Wordstar**, a popular word processor for the PC. **GEM Write** supports pagination, justification, single-line headers and

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footers, block editing, and search and replace functions.

Probably its strongest feature is the ability to merge a picture into the body of a document. **GEM Paint** files can be brought into the program and placed where you like. Then the entire document can be saved, or printed as one entity. This is how it works on the PC. The availability of **GEM Paint** for the ST is as questionable as is that of **GEM Write** itself.

If you need the ability to merge text with graphics, then you may be inclined to wait around for the ST **GEM Write**. Otherwise, existing GEM-based word processors, such as **HabaWriter** and **1st Word** easily outdistance **GEM Write**'s simple-minded features.

Which is for you?

This comparison review was based on many, many hours of intimate, personal, first-hand use (and, in some instances, abuse) with the currently available word processors for the Atari ST. Having had the chance to get familiar with the ST over the last nine months, and having used the various word processing programs over the last several, has allowed me try each program and form opinions based on empirical data.

I began this project with no favorite programs or axes to grind. I've used dozens of word processing programs on various computers over the last few years. In addition, I spend my daily working hours evaluating hardware and software from the user's viewpoint.

I feel strongly that, for an application program to be the best it can be, it must be designed with a particular computer in mind from the start. A word processing program is limited by the hardware it runs on. If it doesn't take advantage of all the hardware has to offer, it's not an optimum program.

With regard to word processing on the Atari ST, only a GEM-based program can offer the user the most.

My choice, of the programs compared in this article, is **1st Word**. With the exception of a few flaws (which, unless resolved, limit its usefulness), **1st Word** provides the ease of use, power and flexibility that an ST word processing program should.

If you were lucky enough to receive **1st Word** during the 1985 Christmas season for free, all the better. But, even at its list price of $40, it represents what I think is the best ST word processor.

1st Word should satisfy the word processing needs of the majority of ST owners. For that matter, **HabaWriter** would probably be okay, too (especially version 1.2). However, it's slightly more expensive and is copy protected.

If you simply *must* have a text-based word processor, then you can't beat the price of **ST-Writer**. It's freely available on many bulletin boards and on several information services.

Regent Word works as advertised, seems bug-free and is straightforward to use. Multiple menus, which can be accessed in an instant, take you through the assorted commands. There's no need to be a cartographer to navigate your way around this program.

Final Word, from Mark of the Unicorn, is *the* most, of all of these programs. It is the most expensive, the most sophisticated, the most time-consuming to learn. It also weighs the most.

Kidding aside, if you need this much power and are willing to spend some time learning the intricacies of it, **Final Word** may be just right for you.

That's my opinion, based upon hours of use. Of course, the final decision rests with you, since you'll be the one who either blesses or curses the day you brought a particular word processor home to your ST.

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ACE 80 - Disk for all 8-bit models
ACE 80XL - 48K Disk for XL/XE models

by Murray D. Kucherawy, Ph.D.

I love my Atari 800. I bought it in 1982. When I got tired of playing games, I installed a BIT-3 board, purchased the 80-column version of **Letter Perfect** and did serious word processing on a letter-quality printer.

My wife edits an international medical journal. After seeing my system, she purchased two for her office, located in a university hospital. She still chuckles over the raised eyebrows when she talks about her *Atari* word processor.

The 800XL, with its "closed" construction, seemed to shut out third-party entrepreneurs. Except for a brief flurry concerning Atari's XL expansion box, the 80-column capability was gone.

However, Amiable Computer Enhancements has introduced **ACE 80**, a 12K cartridge which will put 80 columns on your TV or monitor. Actually, there are two versions.

First, **ACE 80XL** works in all Atari computers with at least 48K. In the XL and XE models, you can program in BASIC in 80 columns. The **ACE 80XL** also fits the left cartridge slot of the 800, but, of course, you can't use BASIC simultaneously.

The **ACE 80** is a right-cartridge slot version, specifically designed for the 800, so that the left slot is available for your BASIC or other language cartridge.

Upon booting up, **ACE 80** invades the Atari OS and replaces the normal *E:* and *S:* devices (the 40-column editor and screen display) with an 80-column device occupying just under 12K of RAM. A title page immediately appears and awaits a keypress.

You now have the opportunity to utilize a unique feature of **ACE 80**—custom design of the screen display. The START and SELECT keys vary the brightness of the character set and the background (eight levels each), respectively.

SHIFT-START toggles the cursor from flashing to nonflashing to invisible. Finally, since **ACE 80** can operate with an ordinary color TV, control of the background screen color is provided via SHIFT-SELECT (sixteen choices).

Further adjustment is possible later, as your work session progresses. With that done, all that remains is to hit any key to boot your disk (or cartridge on the Atari 800). The screen will present you with an 80x24 display.

The character set is well designed and exhibits complete descenders. All regular alphanumeric characters, graphic characters and control characters are available in both regular and inverse video. Forget about POKE 756,204, however; the international character set of the 800XL is not there.

The central question of this review then becomes "How legible is the display?" The answer depends on what you're using for yours.

A monochrome monitor produces an excellent picture, comparable to that of the BIT-3. A color monitor takes away some of the resolution, but it's still a good image. A color TV gives a good or fair display, depending on how well the set's been aligned, but I couldn't recommend it for extended use. I was unable to test it on a black and white TV, but my guess is that the display would be very good on a properly tuned set.

I recommend that you examine the image on your type of terminal before purchase. Remember, the final screen appearance can be "fine tuned" to your liking by appropriate use of the START and SELECT keys.

ACE 80 BASIC programming requires that you keep some limitations in mind.

The logical line length is 80 characters. Any wrap-around is ignored, so you can't edit program lines longer than one screen line. However, it's a simple matter to jump into 40-column mode, do the editing, then switch back to 80 columns. Editing is noticeably faster than in the 40-column mode.

Serious graphics programmers should note that "drawto" and "fill" commands don't work properly in 80-column mode.

Tabs are permanently set at eight positions apart.

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Review *continued*

Other than these exceptions, all Atari graphics modes function normally.

Some programs, such as **AtariWriter** and **VisiCalc**, will not work with the **ACE 80** cartridge. They don't access the OS devices, but use a custom screen display. The programmers at Amiable Computer Enhancements have developed "patches" which circumvent these problems for certain software products.

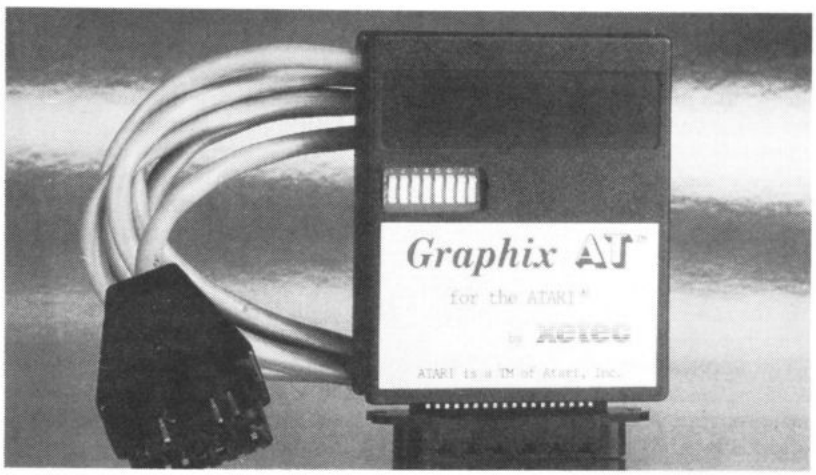
Included with the cartridge is a disk which will insert these patches into a backup copy of your software. All you need do is boot up the disk, select from the menu the program you wish to convert (for example, A+ from OSS), insert your backup copy and press RETURN. In a few seconds, you have a new version, compatible with **ACE 80**.

Other products currently "patchable" are Eastern Software's **MacroAssembler** and LJK's **Letter Perfect**. It should be noted that the patches are for version 2.1 of OS/A+ and version 6 or higher of **Letter Perfect** for the BIT-3 board. Patches for LJK's **Data Perfect** Spell Perfect programs are in the works.

The list price of **ACE 80** or **ACE 80XL** is $49.95, less than 25% of the cost of an 80-column board. With the official demise of the Batteries Included 80-column cartridge, **ACE 80** becomes the most economical way of upgrading your Atari to professional levels.

Murray D. Kucherawy holds a Ph.D. in physics, and teaches mathematics and physics in London, Ontario, Canada. Dr. Kucherawy firmly believes in the future of computers in the classroom (particularly the Atari!) and spends much time promoting computer use among his colleagues.

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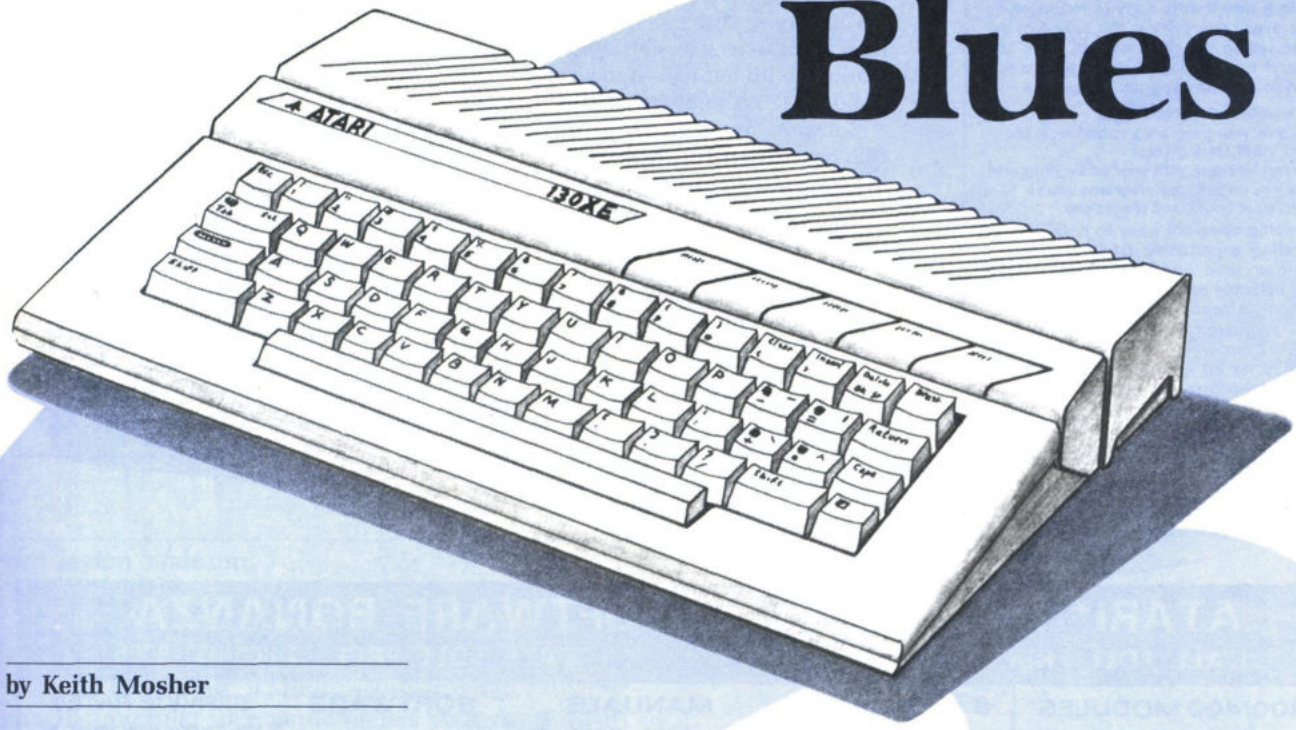
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CIRCLE #142 ON READER SERVICE CARD

The 8-Bit Blues



by Keith Mosher

Two years ago I was painfully hacking away on my 400, typing in **ANALOG Computing** programs and saving them on my 410 program recorder. All the while, I hoped and prayed I could scrape up enough bucks for an 800, or maybe an 800XL.

About a year ago I finally scraped those bucks together. At the same time, the price of the 800XL dropped from about $225 to $175. Wow! What a savings—or so I thought. A few months later, when I bought my first disk drive, I watched the 800XL price drop like a skydiver who hadn't deployed his chute.

I thought I had it made. I thought I had the leading edge of the Atari computer line. But no! Prices for the 800XL continued to drop—and were followed by lower prices for the 130XE and (with trumpets rather muted) the 520ST.

I mean, there I was, sitting at my desk, just sitting there at my desk, and I realized I had just bought a brand new, *obsolete* machine. I mean, right there in **ANALOG Computing** were all kinds of powerful machines with (what?) 500+K of RAM. I was just getting used to having 64K!

Tech is tech.

As a high school student in the seventies (before home computers) I had aspirations of being an Audio Engineer, and now I am one. At the time, the hip thing was to have the leading edge in Audio Technology.

I was proud of my portable GE cassette recorder and my Philco record player, but I lusted after the real hi-fi units pictured in *Stereo Review*, *Mix* and the other audio magazines. Eventually, I purchased one of those leading edge hi-fi units. . . But there, in the magazine the very next day, was a bigger, better, *super new* hi-fi unit. I had bought a brand new, obsolete machine?

I realized then that the wallet is not as fast as the engineer. I also realized that I did (and still do) have an excellent hi-fi system. Oh yes, better things will come along, but I don't need them all. Some of them go beyond the limits of my needs. Someday I *will* have to replace the whole thing, but it serves me well for now.

Back to the future.

So here I sit, typing on my trusty antiquated 8-bit machine, and it's working just fine. I can't afford to trash a complete system because something new has come on-line, especially if what I have meets my needs. Oh yes, someday I'll get one of those new-fangled, whiz-bang machines, but for now. . .

There's the rub.

You see, those of us involved in any technology are alert enough to keep abreast of the latest developments, however, our wallets take a slower pace. And worse, unlike hi-fi enthusiasts, we hackers live or die by our magazines for low-cost programs, insight into our toys, tricks and reviews.

The magazines live on hackers and advertisers. The advertisers live on the computer manufacturers. The computer manufacturers must: (1) sell the user hardware; (2) sell the user more hardware; and (3) sell the user *new* hardware; or go out of business.

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8-Bit Blues *continued*

So what does this mean to those of us who've just spent all we have to buy *brand new, obsolete machines?* It means less space in magazines for the information we can use. It means looking at ads for equipment we can't have yet. It means articles that are of little use, other than to make us feel a little puny while working with our toys. It means watching our $175 computers sell for $69.95.

But wait. Your system is working just fine now, and perhaps the wait will be beneficial. Let someone else find the bugs. Give the technical designers a chance to correct their mistakes (and don't try to tell me they don't make any).

Desiderata.

If you compare your system with others you may become vain and bitter, by turns, for there will always be systems greater and lesser than your own. Stay interested in your system, however humble, if it serves you; it's a real possession in the changing fortunes of time.

Sure, someday you'll save up, relegate the ol' 8-bit to the kids or the garage, and buy one of the new "Top of the Line" (for that week). But do not forsake your system until it's *really* old. Only a few can afford to scrap a system just because something better exists.

Remember, as I learned with hi-fi: if it meets your needs, hang on to it. Enjoy it. Be at peace with your system and soul. With all its shame, drudgery and broken dreams, it's still a beautiful, useful system.

Keith Mosher has a Bachelor's of Media Arts degree from the University of South Carolina, where he's been working as an audio engineer/producer since 1980, producing soundtracks for instructional TV and film. He started computing in 1981 with an Atari 400, the Atari BASIC manual and **ANALOG Computing**.

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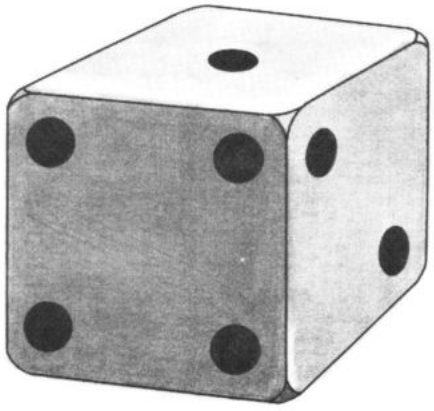
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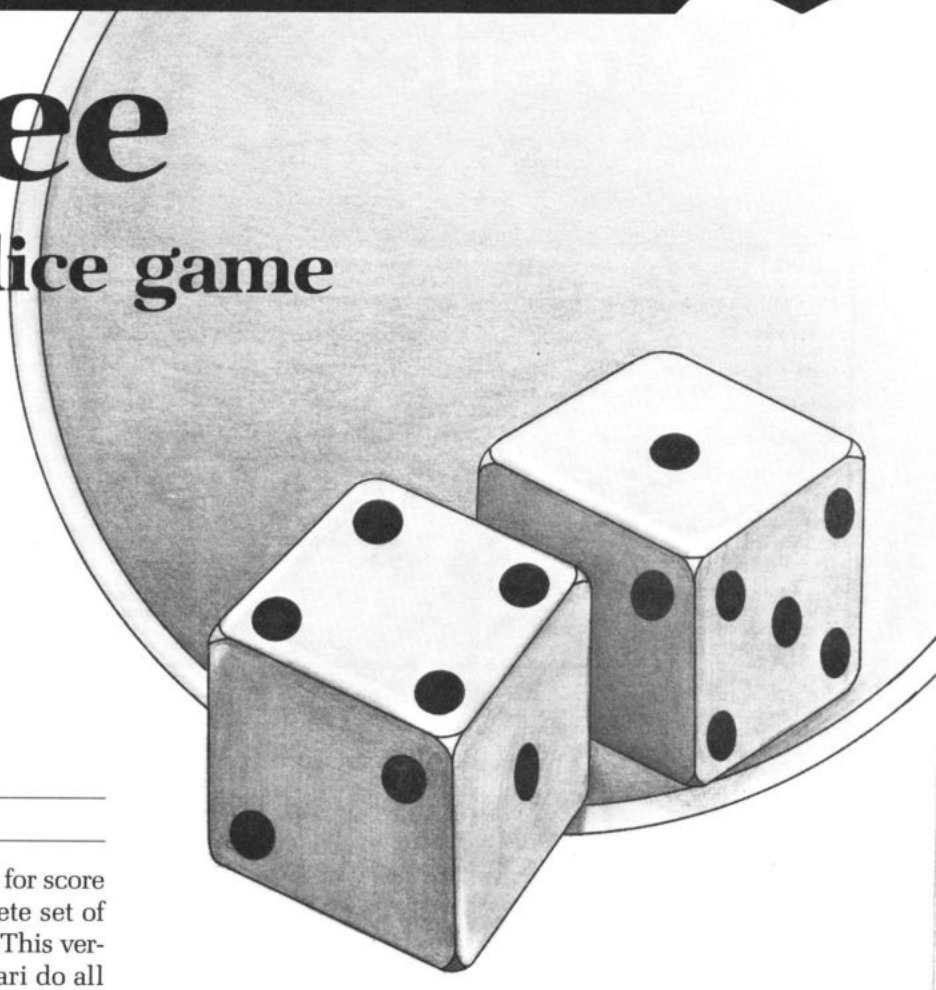
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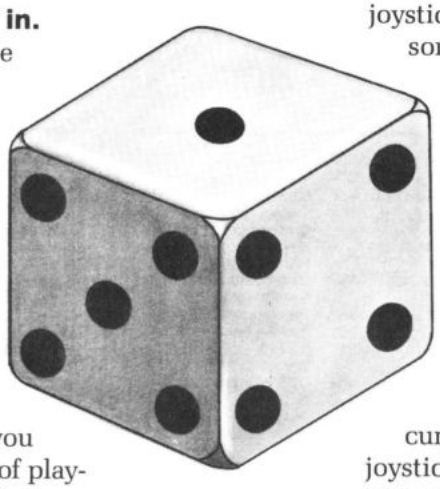


by Clayton Walnum

Okay, folks, here it is! No more scrambling for score pads, no more frantic searches for a complete set of dice and, best of all, no more score tallying! This version of a popular dice game makes your Atari do all the work. Slap that joystick into port 1 and follow me.

Typing it in.

Type in Listing 1, then use **Unicheck** (see page 12) to be sure there are no errors. If you're using a disk system, save the program and skip ahead to the next section. If you are a cassette user, you should add the lines in Listing 2 *after* you've checked your typing with **Unicheck**.



Roll them bones.

When the program is run, you will be asked for the number of players, then prompted to enter their names. Up to six people can play, and each name may have up to ten characters.

The scoreboard is then drawn and the first player's name will appear at the top of the screen. Push the joystick forward to make your first roll. When the roll has been completed, you'll see a cursor appear beneath the dice.

Moving the joystick left or right moves the cursor. Place the cursor under the die you wish to reroll, then press the trigger to finalize your choice. You may choose as many dice to reroll as you wish. If you make a mistake, just press the trigger again—and your choice will be reversed. When you're through, push the joystick forward (be careful not to do this prematurely), and the dice you chose will reroll.

Your third roll is accomplished this same way. If at any time you *don't* want to reroll, just push the stick forward without marking any of the dice. After your final roll, a cursor will appear on the scoreboard. Using the joystick, place the cursor over the appropriate score category and press the trigger. Your score will then be registered.

When one player's turn is completed, the next player should press the trigger, and his scoreboard will appear on the screen. This is not necessary in a one-player game. At the end of the game final scores are displayed. Press the trigger to play again.

If you know how to play poker, you should be able

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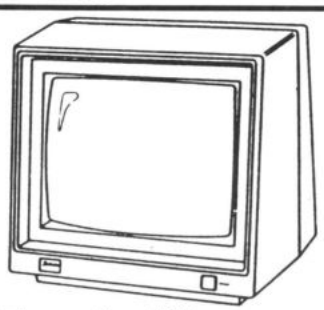
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to jump right into **Atarzee**. The mechanics of the game are simple: you "roll" the dice in an effort to get the best hand. You're allowed three rolls, after which you must pick a score category. You must always pick a category—even if it means scoring a zero.

The scores on the left side of the board are calculated by totalling the number of that category rolled. So, if you had three sixes in your hand and chose the six category, your score would be 18 for that turn. If the subtotal of points earned in categories one through six is 63 or more, you get 35 bonus points.

The right side of the scoreboard should look familiar to poker players. If you roll a three-of-a-kind and pick that category, your score will be the total of the dice. Ditto for four-of-a-kind. A full house (three of one number and two of another) gets you 25 points. A small straight is four consecutive numbers (appearing on-screen in any order) and scores 30 points. A large straight is five consecutive numbers, score is 40. Chance is simply the total of the dice. An **Atarzee** is five-of-a-kind. The first of these rolled is 50 points. Each one after that adds 100 bonus points, plus you can still use the dice in another category!

When the scoreboards are filled, the game is over; final scores are displayed. The highest I've seen is 635. You'll be up into the wee hours to beat that.

One final word: the disk version of **Atarzee** saves the ten highest scores to disk. When playing, be sure you leave the disk in the drive, so the program has access to the data. If you ever wish to start a new high scoreboard, go to DOS and delete the file ATARZEE.DAT. The next time you run the program, a new file will be created. The cassette version retains high scores until the computer's turned off. Roll 'em!

Listing 1.
BASIC listing.

```
10 REM VERSION 1.3
20 N0=0:N1=1:N2=2:N3=3:N4=4:N5=5:N6=6:
N7=7:N8=8:N9=9:N10=10
30 N11=11:N12=12:N13=13:N14=14:N15=15:
N16=16:N17=17:N18=18:N19=19:GOTO 1490
40 REM *******SOUND ROUTINES*******
50 SOUND N0,100,N10,N8:FOR I=N1 TO N10
:NEXT I:SOUND N0,N0,N0,N0:RETURN
60 FOR X=N8 TO N0 STEP -0.4:SOUND N0,1
0,N10,X:SOUND N1,15,N10,X
70 FOR Y=N1 TO N8:NEXT Y:SOUND N0,N0,N
0,N0:SOUND N1,N0,N0,N0:FOR Y=N1 TO N5:
NEXT Y:NEXT X:RETURN
80 REM ******CALCULATE SCORES******
90 S(N7,P)=N0:FOR X=N1 TO N6:IF S(X,P)
)-N1 THEN S(N7,P)=S(N7,P)+S(X,P):NEXT
X:GOTO 110
100 NEXT X
110 IF S(N7,P)>=63 THEN S(N15,P)=35
120 SBT=N0:FOR X=N8 TO N14:IF S(X,P)>-
N1 THEN SBT=SBT+S(X,P):NEXT X:GOTO 140
130 NEXT X
140 S(N16,P)=S(N7,P)+S(N15,P)+SBT:S=N0
:RETURN
150 REM ********PRINT SCORES ********
160 IF NP=N1 AND S=N1 THEN RETURN
170 N1$=N$(P*N10-N9,P*N10):POSITION N9
,N0:? N1$:R=N0:C=N16:S=N1
180 IF NP=N1 AND  NOT START THEN RETUR
N
190 FOR X=N1 TO N13:SOUND N0,X*N15,N10
,N8:SOUND N1,255-X*N15,N10,N8:FOR Y=N1
 TO N5:NEXT Y
200 SOUND N0,N0,N0,N0:SOUND N1,N0,N0,N
0
210 R=R+N2:IF R>N15 THEN R=N2:C=36
220 IF S(X,P)<N0 THEN POSITION C,R:? "
♦ ":NEXT X:GOTO 250
230 SC$=STR$(S(X,P)):IF LEN(SC$)=N1 TH
EN SC$(2)=" "
240 POSITION C,R:? SC$:NEXT X
250 IF S(N14,P)<N0 THEN POSITION 35,N1
4:? "♦  ":GOTO 290
260 SC$=STR$(S(N14,P)):IF LEN(SC$)=N2
THEN SC$(N3)=" "
270 IF LEN(SC$)=N1 THEN SC$(N2,N3)="
"
280 POSITION 35,N14:? SC$
290 POSITION N6,N16:? S(N15,P);" ":POS
ITION N15,N16:? S(N16,P);"  ":START=N0
:RETURN
300 REM ********ROLL DICE**********
310 FOR Y=N1 TO N10:D(D)=INT(RND(N0)*N
6)+N1:POSITION D*N4+N6,N18:? D$(D(D)*N
17-N16,D(D)*N17)
320 SOUND N0,100,N12,N15:SOUND N0,N0,N
0,N0:NEXT Y:RETURN
330 REM ***TOTAL DICE VALUES******
340 FOR X=N1 TO N6:C(X)=N0:NEXT X:FOR
D=N1 TO N5:C(D(D))=C(D(D))+N1:NEXT D:R
ETURN
350 REM *****CHECK FOR ATARZEE******
360 IF YZ THEN RETURN
370 GOSUB 340:FOR X=N1 TO N6:IF C(X)=N
5 THEN YZ=N1:POP :GOTO 390
380 NEXT X:RETURN
390 C2=PEEK(712):FOR X=N0 TO 255 STEP
N2:POKE 712,X:SOUND N0,X,N10,N8:SOUND
N1,255-X,N10,N8:NEXT X
400 POKE 712,C2:SOUND N0,N0,N0,N0:SOUN
D N1,N0,N0,N0
410 IF S(N14,P)<=N0 THEN RETURN
420 S(N14,P)=S(N14,P)+100:POSITION 35,
N14:? S(N14,P)
430 GOSUB 120:POSITION N15,N16:? S(N16
,P);" ":RETURN
440 REM *****ERASE PROMPT LINE*****
450 POSITION 20,N16:? #N6:"
      ":RETURN
460 REM ******MAIN GAME LOOP*******
470 P=P+N1:POKE 77,N0:IF P>NP THEN P=N
1
480 YZ=N0:TRN=TRN+N1:IF TRN>N13*NP THE
N 1200
490 GOSUB 160:POSITION 21,N16:? "PUSH
STICK TO ROLL";
500 IF STICK(N0)<>N14 THEN 500
510 GOSUB 450:FOR D=N1 TO N5:GOSUB 310
:NEXT D:GOSUB 360
520 POSITION 20,N16:? "PICK DICE TO RE
ROLL"
530 C=N11:POSITION C,21:? "^"
540 ST=STICK(N0):IF ST=N14 THEN 650
550 IF STRIG(N0)=N0 THEN 610
560 IF ST<>N7 AND ST<>N11 THEN 540
570 C0=C
580 IF ST=N7 THEN C=C+N4:IF C>27 THEN
C=27
590 IF ST=N11 THEN C=C-N4:IF C<N11 THE
```

```
N C=N11
600 POSITION C0,21:? " ":POSITION C,21
:? "^";:FOR X=N1 TO 50:NEXT X:GOTO 540
610 D=(C-N7)/N4:IF D(D)<N0 THEN POSITI
ON C,N17:? " ";:GOTO 630
620 POSITION C,N17:? "*";
630 D(D)=-D(D)
640 SOUND N0,100,N10,N8:FOR X=N1 TO N1
0:NEXT X:SOUND N0,N0,N0,N0:FOR X=N1 TO
 100:NEXT X:GOTO 540
650 GOSUB 450:FOR X=N11 TO 27 STEP N4:
POSITION X,N17:? " ";:NEXT X:POSITION
C,21:? " ";
660 FOR X=N1 TO 100:NEXT X:RL=RL+N1
670 FOR D=N1 TO N5:IF D(D)>N0 THEN NEX
T D:GOTO 690
680 GOSUB 310:NEXT D
690 GOSUB 360
700 IF RL=N2 THEN RL=N0:GOTO 720
710 GOTO 520
720 POSITION 22,N16:? "SELECT CATEGORY
":A=79:C=N2:R=N2:POSITION C,R:? "0"
730 IF STRIG(N0)=N0 THEN 820
740 ST=STICK(N0):IF ST<>N13 AND ST<>N1
4 THEN 730
750 RO=R:CO=C
760 IF ST=N14 THEN R=R-N2:IF R<N2 AND
C=N2 THEN R=N14:C=21
770 IF R<N2 AND C=21 THEN R=N12:C=N2
780 IF ST=N13 THEN R=R+N2:IF R>N12 AND
 C=N2 THEN R=N2:C=21
790 IF R>N14 THEN R=N2:C=N2
800 LOCATE CO,RO,A:POSITION CO,RO:? CH
R$(A-128)
810 LOCATE C,R,A:POSITION C,R:? CHR$(A
+128):FOR X=N1 TO 50:NEXT X:GOTO 730
820 POSITION C,R:? CHR$(A);:A=N7*(C=21
)+R/N2:GOSUB 450:GOSUB 340
830 IF S(A,P)>=N0 THEN SOUND N0,100,N1
2,N8:FOR X=N1 TO 100:NEXT X:SOUND N0,N
0,N0,N0:GOTO 720
840 GOSUB 60:GOSUB 450:GOSUB 340
850 ON A GOTO 870,870,870,870,870,870,
0,900,900,930,1010,1010,1060,1080
860 REM ************1 - 6************
870 S(A,P)=N0:FOR D=N1 TO N5:IF D(D)=A
 THEN S(A,P)=S(A,P)+A
880 NEXT D:GOSUB 90:GOTO 1120
890 REM *****3 OR FOUR OF A KIND*****
900 S(A,P)=N0:NM=R/N2+N2:FOR D=N1 TO N
5:S(A,P)=S(A,P)+D(D):NEXT D
905 FOR X=N1 TO N6:IF C(X)>=NM THEN GO
SUB 90:GOTO 1120
910 NEXT X:S(A,P)=N0:GOSUB 90:GOTO 112
0
920 REM *********FULL HOUSE*********
930 F2=N0:F3=N0
940 FOR X=N1 TO N6:IF C(X)=N0 THEN NEX
T X:GOTO 980
950 IF C(X)=N2 THEN F2=N1
960 IF C(X)=N3 THEN F3=N1
970 NEXT X
980 IF F2 AND F3 THEN S(N10,P)=25:GOSU
B 90:GOTO 1120
990 S(N10,P)=N0:GOSUB 90:GOTO 1120
1000 REM **********STRAIGHTS**********
1010 CN=N0:NM=R/N2:SC=(NM-N1)*N10:FOR
X=N1 TO N6:IF C(X)<N1 THEN CN=N0:NEXT
X:GOTO 1040
1020 CN=CN+N1:IF CN=NM THEN S(NM+N7,P)
=SC:GOSUB 90:GOTO 1120
1030 NEXT X
1040 S(NM+N7,P)=N0:GOSUB 90:GOTO 1120
1050 REM **********CHANCE**********
1060 S(N13,P)=N0:FOR D=N1 TO N5:S(N13,
P)=S(N13,P)+D(D):NEXT D:GOSUB 90:GOTO
1120
1070 REM *********ATARZEE**********
1080 FOR X=N1 TO N6:IF C(X)=N5 THEN 11
00
1090 NEXT X:S(N14,P)=N0:GOTO 1110
1100 S(N14,P)=50
1110 GOSUB 90
1120 POSITION N16+20*(A>7)-(A=14),A*2-
14*(A>7):? S(A,P)
1130 POSITION N16,N14:? S(N7,P):POSITI
ON N6,N16:? S(N15,P)
1140 POSITION N15,N16:? S(N16,P)
1150 IF NP=N1 THEN 470
1160 POSITION 20,N16:? "     PRESS BUTT
ON     "
1170 IF STRIG(N0)<>N0 THEN 1170
1180 GOTO 470
1190 REM ********GAME OVER********
1200 CN=N0:P=N1:FOR X=N1 TO N10:PR(X)=
N0:NEXT X
1210 IF S(N16,P)<=R5(N10) THEN 1290
1220 CN=CN+N1:IF S(N16,P)>R5(CN) THEN
1240
1230 GOTO 1220
1240 FOR X=N9 TO CN STEP -N1:R5(X+N1)=
R5(X):PR(X+N1)=PR(X):R5$((X+N1)*N10-N9
,(X+N1)*N10)=R5$(X*N10-N9,X*N10)
1245 NEXT X
1250 A=N0:N1$=N$(P*N10-N9,P*N10):FOR X
=N1 TO N10:IF N1$(X,X)<>" " THEN NEXT
X:GOTO 1280
1260 A=A+N1:IF A=N2 THEN FOR Y=X-N1 TO
 N10:N1$(Y,Y)="-":NEXT Y:GOTO 1280
1270 NEXT X
1280 R5(CN)=S(16,P):PR(CN)=N1:R5$(CN*N
10-N9,CN*N10)=N1$:FL=N1
1290 CN=N0:P=P+N1:IF P<=NP THEN 1210
1300 IF FL THEN CLOSE #1:OPEN #N1,N8,N
0,"D:ATARZEE.DAT"
1310 IF FL THEN FOR X=N1 TO N10:? #N1;
R5(X):? #N1;R5$(X*N10-N9,X*N10):NEXT X
:CLOSE #N1:FL=N0
1320 GRAPHICS N17:POSITION N7,N4:? #N6
;"SCORES":POSITION N7,N5:? #N6;"------
"
1330 FOR X=N1 TO NP:N1$=N$(X*N10-N9,X*
N10)
1340 FOR Y=N1 TO N10:IF N1$(Y,Y)=" " T
HEN N1$(Y,Y)="-":NEXT Y:GOTO 1360
1350 NEXT Y
1360 POSITION N3,N6+X:? #N6;N1$:POSITI
ON N13,N6+X:? #N6;"-";S(N16,X)
1370 SOUND N0,X*30,N10,N8:SOUND N1,255
-X*30,N10,N8:FOR Y=N1 TO 20:NEXT Y:SOU
ND N0,N0,N0,N0:SOUND N1,N0,N0,N0
1380 NEXT X:GOSUB 1460
1390 GRAPHICS N17:POSITION N3,N0:? #N6
;"record scores"
1400 POSITION N3,N1:? #N6;"------------
--"
1410 FOR X=N1 TO N10:POSITION N3,X+N4:
? #N6;R5$(X*N10-N9,X*N10);"-";R5(X):NE
XT X
1420 FOR Z=N1 TO N10:IF PR(Z)=N0 THEN
NEXT Z:GOTO 1450
1430 FOR X=1 TO 50:NEXT X
1440 POSITION N2,Z+N4:? #N6;">":GOSUB
60:NEXT Z
1450 GOSUB 1460:GOTO 1690
1460 POKE 711,N15:POSITION 2,22:? #6;"
push fire button"
1470 FOR X=N1 TO 50:NEXT X:POKE 711,N0
:IF STRIG(N0)=N0 THEN RETURN
1480 FOR X=N1 TO 50:NEXT X:POKE 711,N1
4:GOTO 1470
1490 DIM D$(102),N$(60),N1$(N10),BD$(4
0),YZ(N6),D(N6),C(N6),S(N16,N6),SC$(N3
),R5$(100),R5(N10),PR(N10)
```

```
1500 D$="■■■↓↓↓■■■↓↓↓■■■■■↓↓↓■■■↓↓
↓■■■■■↓↓↓■■■↓↓↓■■■■■↓↓↓■■■↓↓↓■■■
■■■↓↓↓■■■↓↓↓■■■■■↓↓↓■■■↓↓↓■■■"
1510 BD$="|                    | |
          |"
1520 N$(N1)=" ":N$(60)=" ":N$(N2)=N$
1530 GRAPHICS N0:POKE 752,N1:POKE 710,
N0:DL=PEEK(560)+PEEK(561)*256+N4:POKE
DL+N6,N6:POKE DL+N7,N6:POKE DL+N17,N7
1540 POSITION N2,N5:? "CLAYTON WALNUM'
S":POSITION N6,N15:? "atarzee"
1550 FOR X=N1 TO N5:POSITION X*N5+N3,N
8:? D$(86,102):FOR Y=255 TO N0 STEP -2
0:SOUND N0,Y,N10,N8:NEXT Y:NEXT X
1560 SOUND N0,N0,N0,N0:FOR X=N0 TO 255
 STEP N4:POKE 709,N10*(INT(X/N16)=X/N1
6)
1570 SOUND N0,X,N10,N8:SOUND N1,255-X,
N10,N8:NEXT X
1580 SOUND N0,N0,N0,N0:SOUND N1,N0,N0,
N0:POKE 709,N10
1590 POKE 82,N0:POSITION 21,N19:? "COP
YRIGHT (C) 1986 BY ANALOG COMPUTING":F
OR X=N1 TO 500:NEXT X
1600 GRAPHICS N0:POKE 559,N0:POKE 752,
N1:POKE 710,50:FOR X=N3 TO 22:POKE DL+
X,N6:NEXT X:? CHR$(125):POKE 559,34
1610 TRAP 1610:POSITION N0,N3:? #N6;"#
 OF PLAYERS       ";:POSITION N12,N3
1620 INPUT NP:IF NP<N1 OR NP>N6 THEN 1
610
1630 FOR X=N1 TO NP
1640 TRAP 1640:POSITION N0,N3+X:? "#";
X;"'S NAME";:INPUT N1$
1650 N$(X*N10-N9,X*N10-(N10-LEN(N1$)))
=N1$:NEXT X
1660 POSITION N1,22:? #N6;"ONE SECOND.
..."
1670 TRAP 1890:OPEN #N1,N4,N0,"D:ATARZ
EE.DAT"
1680 FOR X=N1 TO N10:INPUT #N1;A:R5(X)
=A:INPUT #N1;N1$:R5$(X*N10-N9,X*N10)=N
1$:NEXT X:TRAP 40000
1690 FOR X=N1 TO N16:FOR Y=N1 TO N6:S(
X,Y)=-N1:NEXT Y:NEXT X
1700 FOR X=N1 TO N4:FOR Y=N1 TO N6:S(N
7,Y)=N0:S(N15,Y)=N0:S(N16,Y)=N0:NEXT Y
:NEXT X:P=N0:TRN=N0:S=N0:START=N1
1710 GRAPHICS N0:DL=PEEK(560)+256*PEEK
(561)+N4:POKE DL-N1,64+N6:POKE DL+N2,N
6:POKE DL+N18,N6:POKE DL+N19,134
1720 POKE 752,N1:POKE 712,N8:POKE 709,
N0:POKE 710,22:POKE 708,118
1730 RESTORE :FOR X=N0 TO N19:READ A:P
OKE 1536+X,A:NEXT X
1740 DATA 72,138,72,169,12,162,0,141,1
0,212,141,23,208,142,24,208,104,170,10
4,64
1750 POKE 512,N0:POKE 513,N6:POKE 5428
6,192
1760 POSITION N1,N1:? "┌──────────────
──┐ ┌──────────────────┐"
1770 FOR X=N2 TO N12:POSITION N1,X:? B
D$:NEXT X
1780 POSITION N1,N13:? "├──────────────
──┤ │                  │"
1790 POSITION N1,N14:? BD$:POSITION N1
,N15:? "└──────────────┘ └──────────────
──┘"
1800 POSITION N2,N2:? "Ones----------♦
":POSITION N2,N4:? "Twos----------♦"
1810 POSITION N2,N6:? "Threes--------♦
":POSITION N2,N8:? "Fours---------♦"
1820 POSITION N2,N10:? "Fives---------
♦":POSITION N2,N12:? "Sixes---------♦"
1830 POSITION 2,N14:? "SUBTOTAL:"
1840 POSITION 21,N2:? "3 of a kind----
♦":POSITION 21,N4:? "4 of a kind----♦"
1850 POSITION 21,N6:? "Full house-----
♦":POSITION 21,N8:? "Small straight-♦"
1860 POSITION 21,N10:? "Large straight
-♦":POSITION 21,N12:? "Chance---------
♦":POSITION 21,N14:? "ATARZEE-------♦"
1870 POSITION N1,N0:? "player:":POSITI
ON N8,N16:? "bonus:":POSITION N9,N16:?
 "score:"
1880 FOR X=N1 TO N5:POSITION N6+X*N4,N
18:? D$(X*N17-N16,X*N17):NEXT X:GOTO 4
60
1890 R5$(N1)=" ":R5$(100)=" ":R5$(N2)=
R5$
1900 CLOSE #N1:OPEN #N1,N8,N0,"D:ATARZ
EE.DAT"
1910 FOR X=N1 TO N10:R5(X)=0:? #N1;R5(
X):? #N1;R5$(X*N10-N9,X*N10):NEXT X
1920 CLOSE #N1:GOTO 1690
```

●

CHECKSUM DATA.

(see page 12)

```
10 DATA 620,145,907,207,85,111,404,255
,618,758,261,24,767,184,560,5906
160 DATA 771,824,655,131,295,500,211,1
63,0,95,523,809,528,595,799,6899
310 DATA 130,647,473,444,396,356,474,7
92,358,769,106,553,581,313,888,7280
460 DATA 99,206,838,322,911,132,598,66
5,473,763,541,110,469,612,781,7520
610 DATA 505,434,685,141,912,644,298,6
90,2,221,712,466,768,192,163,6833
760 DATA 506,670,428,683,941,325,300,3
76,116,518,581,84,802,626,50,7006
905 DATA 10,140,154,134,413,376,384,79
5,634,689,399,939,615,532,987,7201
1050 DATA 689,569,853,141,174,126,895,
489,307,946,841,62,49,889,58,7088
1200 DATA 9,56,55,711,743,549,593,84,5
42,451,673,62,11,705,41,5285
1340 DATA 609,546,196,531,180,924,818,
826,931,597,63,376,42,959,370,7968
1490 DATA 160,31,546,879,739,949,985,3
39,308,181,886,520,226,951,681,8381
1640 DATA 511,975,6,764,9,822,536,265,
595,292,153,276,227,129,548,6108
1790 DATA 491,348,730,813,395,122,962,
479,380,797,551,841,945,83,7937
```

●

Listing 2.
BASIC listing.

```
1300 REM
1310 REM
1670 GOTO 1890
1680 REM
1900 REM
1910 FOR X=N1 TO N10:R5(X)=0:NEXT X:GO
TO 1690
1920 REM
```

●

CHECKSUM DATA.

(see page 12)

```
1300 DATA 284,285,747,301,302,799,304,
3022
```

●

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"Magniprint II is a versatile and powerful program which will meet most, if not all your print out needs."
ANALOG MAGAZINE

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The plus is in the shading — now Magniprint lets you print the highest quality reproductions of your screens available anywhere. It lets you choose the shading you want for the different colors and shades on the screen. It allows you to adjust the shades while your picture is displayed on the screen, so what you see is what you get. Magniprint prints the shades on your standard printer and paper by using specially designed dot patterns, yielding better looking output than you get on your screen.

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PARROT

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professional musicians
in a band!



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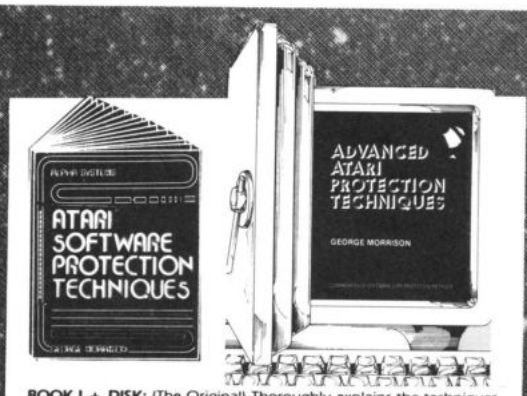
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CIRCLE #146 ON READER SERVICE CARD

PANAK STRIKES!



by Steve Panak

Of all the games I play, I especially enjoy simulations, whether of sports, strategy, or swords and sorcery. It's their realism—a little more at stake than bright pixels dueling to the death in black, cathode-tube space. It's troublesome, but expected, that these games also take the most time to analyze.

As the arcade games die a lingering death, the void is being filled by simulations, from SSI and from Microprose. In the past few months, I've toyed with some Microprose titles, to find that they've gracefully combined realism with historical accuracy. More than a game, each offering is an experience.

In fairness, I should give SSI its share of the spotlight. Thus, I've forsaken other temptations this month, to bring you a review of a couple of simulations so substantial you'll *smell* the gunpowder.

BATTALION COMMANDER
by David Hille

COLONIAL CONQUEST
by Dan Cermak
SSI
883 Stierlin Rd., Bldg. A-200
Mountain View, CA 94043-1983
48K Disk $39.95

Simulations are the hardest kind of software to create and sell. The well-crafted simulation must be both realistic and simple to play—two diametrically opposed qualities. To increase realism, you must also increase the variables accounted for. As the variables increase, so must the choices at any given point in the game. The more choices you have, the more difficult it is to *make* all those choices, and the more difficult and time-consuming the game becomes.

It's a vicious circle. Even if you should create a piece of simulation software which breaks this cycle, you still have a larger barrier to your success—selling it. The simulation market isn't as large as the arcade action market (although the latter is rapidly shrinking). Most people simply don't wish to invest the time it takes to learn to play a realistic simulation. However, if you wish to invest a little time, these two games are well worth it.

Battalion Commander places you in command of an army battalion. This unit has companies and platoons, as well as various support (supply regiments and engineers), all fiercely loyal to you, their fearless leader. However, as mentioned before, you might be powerless to adequately guide your troops if the controls bog you down.

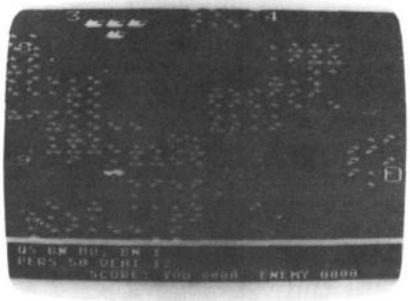
This proves not to be a problem in **Battalion Commander**, as most commands are issued to the level of authority just below you. These junior commanders actually order the troops to their destinies, just as in reality.

Using the joystick or keyboard, you move the cursor about on-screen, either to scroll the display (revealing hidden areas), or to gain information about some of your units or enemy units. Of course, not all the information about the enemy is correct—it may be stale or faulty.

Actual commands must be issued with the keyboard, by pressing two keys. The first identifies the unit to whom the command is issued; the second is the command itself. You can tell units to go somewhere, shoot something, cease fire or, in the case of the special units, build (or destroy) a bridge or deliver supplies.

The easy-to-use summary of controls on the back of the manual makes the

game easy to get into. Once commands are learned, they can be issued rapidly. This is important, as in this real-time simulation, the enemy isn't likely to wait for you to make up your mind (unless you hit the PAUSE key).



Battalion Commander.

To keep the game interesting, there are four scenarios available. In "attack," the object is to break through the enemy line, while in "defense," the tables are turned, and you must repel an attacker. In "pursuit and exploitation" (my personal favorite), once you've broken through the defenses, you must destroy as much as possible. In the "meeting engagement," two forces of roughly equal strength meet and slug it out.

These four games are multiplied by three options, to obtain quite a multitude of game variations. You can change the nationalities and relative strengths of the units, as well as the terrains (and with forty available, it's unlikely you'll ever use them all).

The manual is set up quite nicely and is organized to allow you to rapidly start playing the game (a trait past SSI manuals haven't always had). It's divided into sections containing basic instructions, detailed explanations and appendices summarizing most of the game's variables. **Battalion Commander** offers you a realistic glimpse of what it's like to lead an army battalion into a number a various combat situations.

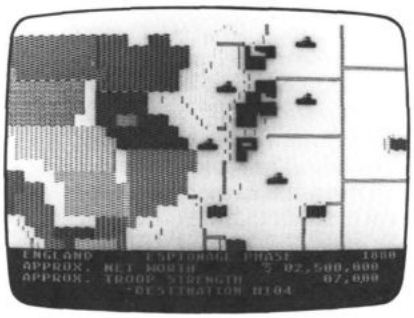
Colonial Conquest, on the other hand, offers megalomaniacs out there the lure of world domination. Basically a computerized version of the old board game Risk, this program adds subtleties which make play much more enjoyable, exciting and realistic.

Six major countries (England, Germany, France, America, Japan and Russia), each controlled by either the computer or a player, attempt to attain the age-old goal of world domination. Whether any one achieves this goal depends on cunning and diplomacy, along with a pinch of treachery.

There are 120 minor countries to gain control of—plus any of the major countries not taken by a human gamer. Control is obtained through the use of six game phases. In the "build" phase, you build up your armies; in "fortify," you give money to friendly countries so they can build up their armies. "Economic aid," has you supply money to major and neutral minor countries, while, in "subversion," you bribe another country's forces to weaken them. In "movement," predictably, you move your forces. Finally, the "combat" phase is performed by the computer, which determines the outcome of all hostilities in a cold and calculating manner.

Points are awarded for countries captured, deducted for countries lost. They're also awarded for gaining territory. You can play to a set score, or indefinitely. For those long games, a multiple save-game feature is included. Three scenarios (1880 and 1914—which set up world allegiances as they were in those years—and a random set-up) round out the features of the game.

Basically, the easiest way to know whether you'll like this game or not is to determine whether you like Risk. (I have to assume that most people have had some exposure to that classic game.)



Colonial Conquest.

Colonial Conquest plays pretty much like Risk, except that it's much more realistic, taking into account many more variables and allowing for many more options.

It also allows for diplomacy—that is, agreements between countries. What form of treachery and backstabbing these agreements take is entirely up to you. The only restriction is that you can't spy while another player enters moves into the computer. Unlike Risk, your time here isn't taken up rolling dice to determine the outcome of battles. However, like Risk, this game is only entertaining if played by many people—in fact, the computer really only acts as scorekeeper, even though it can control major countries.

The manual is superb, quickly and concisely explaining the game, then going into some historical detail. Rounding out the manual is an appendix detailing the various attributes of the 130 countries of the game.

But not all is good news. The graphics I found below average and rather difficult to keep track of. However, since this isn't a graphics-oriented game, it's not a major problem.

Balancing this drawback is the excellent program design, which allows you to access critical DOS functions without leaving the program—say, to format that save game disk you just decided you needed, as well as ask for a directory. Anyone who's found themselves in the middle of a great game without a disk ready to save knows how painful that can be.

Colonial Conquest is an excellent game for a group bent on fighting each other for global domination. Of course, getting such a group together may be the biggest setback of the game. But, assuming you assemble a houseful of Napoleons, **Colonial Conquest** will certainly appease them.

Overall, I have to say, in the simulation field, SSI is still on top. Whether or not they'll remain there is anybody's guess. But with **Colonial Conquest** and **Battalion Commander**, they've certainly proven that they won't give up without a fight.

TRACK AND FIELD
by Konami
ATARI CORP.
P.O. Box 61657
Sunnyvale, CA 94088
16K Cartridge $29.95

This is the first new game cartridge from Atari for quite a while. A few years ago, the combination of this game and a new controller in one package would have been a great value. Today, though, the game is old and the value negligible.

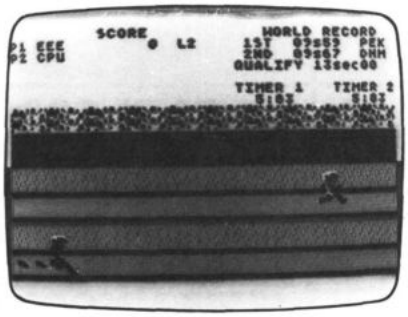
Track and Field is the home version of the arcade game which made the rounds about four years ago. Since the local arcade had dwindled yet again in size, I was unable to retest the arcade version. My recollections are surely as stale as last year's star athletes, but I've noticed that there are, as usual, both

similarities and differences in the two versions.

From the manual, it seems apparent that the game is meant (even at this late date) to cash in on the L.A. Olympics. After all, it is the official Home Computer Game of the 1984 Olympic games—but I'd rather not get into what I think of "official Olympic" items right now.

Unlike the epic world Olympics, this cartridge features only six events: the 100-meter dash, the long jump, the javelin throw, the 110 meter hurdles, the hammer throw and the high jump.

As in the arcade version, you must complete each event within a certain qualifying time, in order to progress onward. Control is very simple, and most events depend on proper timing when pressing that button or tilting that joystick.



Track and Field.

Using either a joystick or the special **Track and Field** controller, you run and jump your way into the record books (although a complaint I have, which I have with all cartridges, is that the high score is held only as long as the power lasts—little chance of becoming a sports legend). The supplied controller has three buttons, two of which you hammer on rhythmically to run, while the action button is used to jump or to launch the hammer or javelin. As is typical with sporting games of this type, it's impossible to duplicate the many variables present in the real thing.

The game has many downfalls, but when the two-player version is played with the proper opponent, you'll both have a good, sporting time. The manual is the typical Atari offering, colorful but without much substance. Each event is described, along with hints to help you win.

Further, the availability of a new controller provokes me to hope that new games will be offered, which will also use the thing. The firm, heavy base makes its three buttons easy to activate. This seems a weak selling point at best, considering the availability of **Summer Games** (I or II), which is still, in my opinion, the best available sporting omnibus. In my stadium, **Track and Field** strikes out.

ZORRO
by James Garon
DATASOFT
19808 Nordhoff Place
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48K Disk $29.95

If there's one word to convey my opinion of this game, as a whole that word would be *pathetic*. **Zorro** is the video version of the lengendary movie hero, who is, no doubt, turning over in his celluloid grave. While filmdom's Zorro could fight his way to the girl with his trusty sword, this **Zorro** would have trouble cutting his way out of a tin can with a can opener.

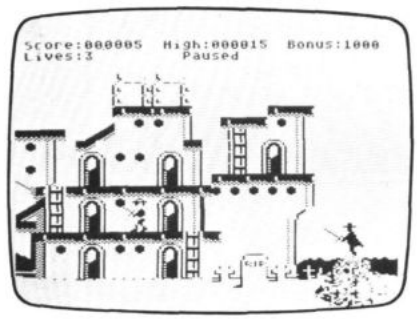
The graphics are acceptable on the new machines, and on-screen action moves at a rather rapid rate. However, on an 800 with the old graphics chip, the figures are more sticklike than human.

Control was, at times, hard to master; at other times, it was impossible. Not knowing just what joystick movement to use for the desired on-screen action was frustrating. This is partly due to the sparse instruction manual, but mostly it's due to the concept of the game itself.

The back panel of the manual provides some boring background babble about how Evil Sergeant Garcia has captured a beautiful senorita and imprisoned her in his fort. Predictably, your mission is to rescue her, as well as obtain whatever treasure you can along the way. You do this by solving puzzles and surviving perils on each of the many screens.

The manual gives little guidance as to exactly *how* you're to carry out this dismal mission. Oh, it provides hints, like: **Zorro** may carry only one object at a time. As always, killing guards (the disposable servants of video games) is good for at least a couple points. Similarly, you can pick up money for credit. Mapping is suggested to ensure that you'll find everything you need to rescue the fair maiden. I hardly think it will be necessary.

This is because, before you really get into the game, you're very likely to have grown tired of it. I doubt there are many



Zorro.

people out there who've finished **Zorro**, and I don't see how anyone but a masochist could possibly have done it more than once.

I guess that, brandishing your pixel sword, you're supposed to run about slicing and dicing up guards, plundering and looting the fort. In the movies, such adventure is fun. But it's not the case here, with yet another unoriginal arcade-action game. Although he might make it as a legendary movie and literary hero, as a video game **Zorro**'s a big zero.

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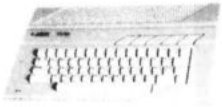
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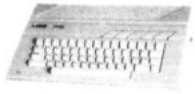
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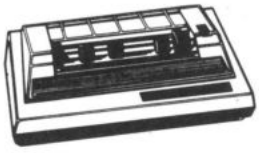
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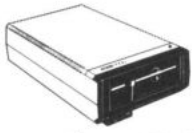
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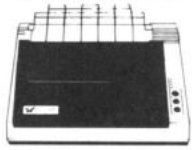
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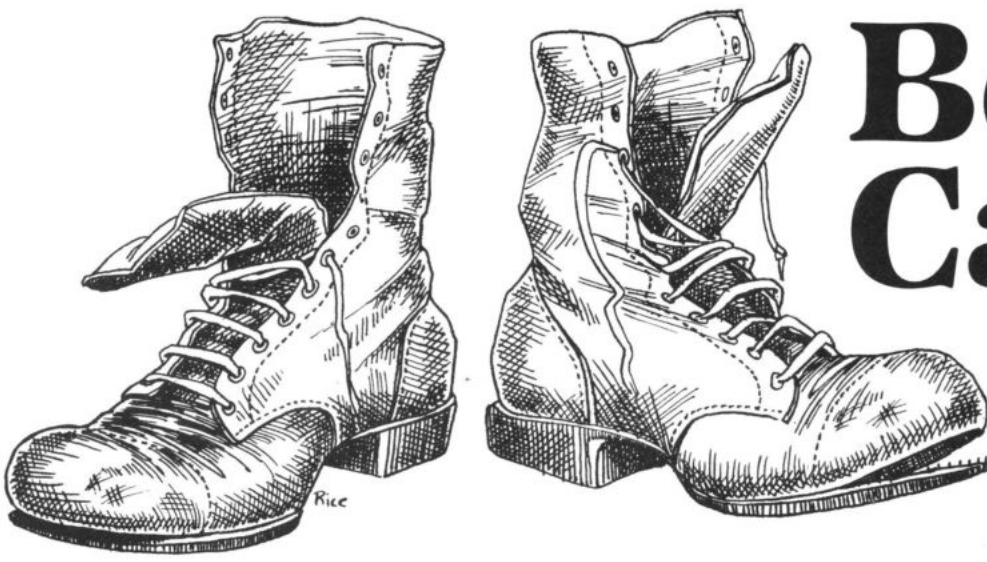
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CIRCLE #148 ON READER SERVICE CARD



Boot Camp

by Karl E. Wiegers

Last month, we explored how to use the built-in power of Atari's Central Input/Output system (CIO) in an assembly language program to display text in graphics modes 0, 1 and 2. First we used CIO to open the graphics screen (device *S:*, IOCB #6). Then we saw how to output a record to either the graphics screen or the default screen editor (device *E:*, IOCB #0).

Finally, we used CIO to close IOCB #6, the graphics screen. We also saw how to set the auxiliary bytes ICAX1 and ICAX2 to open the screen in different graphics modes, with or without a text window, with or without clearing the screen.

In this issue, we'll learn how to plot points and draw lines in the lower resolution graphics modes. Methods for setting the contents, then selecting color registers for plotting will be shown, too. As with the first part of this project, the screen displays are not breathtakingly beautiful, but you can take care of that on your own.

Plotting points and drawing lines.

Example 3 in last issue's **Boot Camp** explained how to print a string of text in graphics 1 or 2. If you experimented with the suggestion of changing the graphics mode number to 3, 4 or 5 in that example, you found that your text string was miraculously converted into a line of colored pixels.

In Atari BASIC, the PLOT and DRAWTO statements regulate line drawing operations in a graphics screen. Fortunately, one of the CIO commands available for IOCB #6 is *DRAW*. So let's explore the fundamentals of plotting to a graphics screen using assembly language. Our examples are restricted to graphics modes 3 through 5, since special tricks are needed for the higher resolution modes.

Example 6. — A straight line.

We'll start simply, by just drawing a straight line in a default color (green), in a graphics 5 screen. The program in Listing 4 does the trick. Enter this listing using the Atari Assembler Editor or another assembler.

Be sure to type this listing in using the line numbers shown, since we'll be adding more statements for the next example. The .OPT OBJ,NOLIST statement in Line 40 just makes sure you generate object code starting at location $3000 in RAM. This saves time by not listing the entire program each time you assemble it.

Building on the previous text examples, we have now added the DRAW command (which has a value of 17 decimal, $11 hex) to the equates list (Line 130). The operation to open IOCB #6 for the graphics

screen, (device S:) is the same as in Example 2 last time (Lines 450-570), except that this example uses a full screen (ICAX1 is *12*) of graphics 5 (ICAX2 is 5).

A line segment is defined by the coordinates of its two endpoints. Just as in BASIC, we need to first plot a pixel at the coordinates of one endpoint, then draw to the coordinates of the other endpoint.

A graphics 5 screen can have X-coordinates ranging from 0 through 79 and Y-coordinates from 0 through 47. Be sure you don't try to draw outside the allowable coordinate range, or you'll generate an error. This example draws a line from location 12,10 to 75,40.

The plotting of a single point can be achieved using the PUTREC operation of CIO. This illuminates a single pixel at the coordinates specified in bytes $54 (ROWCRS) for Y and $55 (COLORS) for X. Lines 620-660 in Listing 4 set these coordinates.

This is equivalent to printing a single character on the graphics screen in a text mode. Consequently, the length of the string to be plotted (i.e., the length of the PUTREC buffer in bytes ICBLL and ICBLH) should be set to *1* (Lines 740-780).

In Atari BASIC, the color of points and lines is controlled by selecting a specific color register using the "color" command. You should be able to find a table in your BASIC manual which informs you that, in graphics 5, *COLOR 1* selects color register 0, *COLOR 2* selects register 1, and *COLOR 3* selects register 2.

Don't ask me why. It's an interesting quirk that "printing" certain letters in a graphics mode greater than 2 also selects a particular color register. Printing a capital *A* uses color register 0, *B* calls for register 1, and *C* picks register 2.

This feature makes our lives simpler. Lines 1390-1410 declare some data values, to establish this letter-to-color register relationship. Lines 700-730 then choose one of those text strings to be printed, thereby selecting the register of our choice. Change the *REG1* in Lines 700 and 720 to *REG0* or *REG2*, to see the effect. Finally, the JSR CIOV in Line 780 plots our point where we want it.

Now, to simulate the BASIC "drawto" command. First, set the coordinates of the line's endpoint, just as we did for the starting point (Lines 830-870). Then, set up IOCB #6 for a draw operation in Lines 910-940. Lines 950-960 again show the selection of color register 1 (*COLOR 2* statement in BASIC).

The number that would appear in the color statement must be stored in location 763 ($2FB, ATACHR). This will ensure that our line is drawn using the default color in color register 1, a light green. You can change the value stored in ATACHR to draw a line in a color different from the one you used to plot the first point. In this case, we did both operations using the same color register, 1.

Finally, let CIOV take over in Line 970, and your line magically appears. Of course, IOCB #6 needs to be closed before you can run the program again. The routine in Lines 1210-1250 should be familiar from the previous examples as a close screen operation. This display will remain on the screen until you press BREAK or SYSTEM RESET, thanks to the infinite loop in Line 1270.

Example 7. — Drawing multiple lines.

No one's going to get excited about drawing a single straight line in a medium-resolution display. However, a straightforward extension of the program in Listing 4 will plot a series of points and connect them with lines.

You can modify this routine to draw as many line segments as you like, all at top machine speed. Now merge the statements in Listing 5 with your program from Listing 4. Many of the lines in Listing 4 are replaced in Listing 5, so you may wish to save the former intact before proceeding.

The approach here is to plot the initial point of our figure as in the previous example, then look up additional pairs of coordinates from data tables. These points will be plotted successively and will serve as the endpoints for a series of line segments to complete the figure. If all goes well, we'll end up with a five-pointed star in the middle of the screen.

The first point is plotted as before in the PLOTPOINT routine (Lines 620-780). This time, we select color register 0 as our plotting color, by doing a PUTREC operation with a letter *A* (Lines 700-730 again).

The contents of the color registers themselves are changed in Lines 830-860, to give a yellow drawing on a purple background. This is equivalent to using the "setcolor" command in BASIC. Color register 0 is selected for the drawing operation in Lines 870-880.

Two tables of X- and Y-coordinates are defined at the end of the program (Lines 1330-1340). The routine in Lines 930-1070 extracts points from these tables and calls a DRAWLINE subroutine, which executes the DRAW operation of CIO (Lines 1120-1170). Except for the fact that this segment of code is a subroutine and thus terminates with an RTS (return from subroutine) instruction, it's equivalent to the drawing step from Listing 4. Notice that we can have

as many DRAWs as we like in a row; only the very first point must be plotted with the PUTREC operation.

The Y-register of the 6502 microprocessor is used as an offset pointer to the next entry in the data tables. It begins with a value of 0 (Line 930). We use this offset to get the next X-coordinate and store it in the appropriate location (Lines 950-960), then do the same for the Y-coordinate (Lines 970-980).

Since CIO operations tend to change the X- and Y-registers, we will save the contents of the Y-register on the stack before executing the DRAW (Lines 990-1000), then retrieve it afterward (Lines 1020-1030).

The pointer is incremented after the drawing procedure (Line 1040). When the value of this pointer reaches 5 (Lines 1050-1070), we've plotted all five pairs of points in this example. The program branches to the CLOSESCREEN routine at Lines 1210-1250.

It should be easy to see how to use this approach in your own programs, any time you want to draw a series of connected lines.

The BASIC equivalent.

Let's see how we would write the program from Example 7 in Atari BASIC:

```
10 GRAPHICS 5+16
20 SETCOLOR 0,1,12
30 SETCOLOR 4,6,8
40 COLOR 1
50 PLOT 20,15
60 DRAWTO 60,15
70 DRAWTO 28,35
80 DRAWTO 40,5
90 DRAWTO 52,35
100 DRAWTO 20,15
110 GOTO 110
```

As with the text examples, BASIC is obviously much less work than doing the same thing in assembly language. However, you'll find times when assembly is really the tool of choice, for many graphics applications.

Conclusion.

These program examples provide an introduction to the use of the 8-bit Atari's built-in input/output capabilities for controlling screen displays. While some additional refinements are needed to use the

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higher resolution graphics modes, these examples should get you started on more serious graphics programming in assembly language.

By combining these concepts with other powerful Atari graphics features, such as the ability to use custom character sets, modified display lists for mixing graphics modes in a single screen, and display list interrupts, you can write sophisticated assembly language programs to achieve effects and speed that BASIC simply cannot provide. Have fun!

Listing 4.
Assembly listing.

```
10 ;Listing 4-Assemble Some Graphics
20 ;by Karl E. Wiegers
30 ;
40       .OPT OBJ,NO LIST
50       *=  $3000
60 ;
70 ;command byte values for various
80 ;CIOV operations
90 ;
0100 OPEN =  $03      ;open IOCB
0110 PUTREC = $09     ;output a record
0120 CLOSE = $0C      ;close IOCB
0130 DRAW =  $11      ;draw a line seg
0140 ;
0150 ;equates for row and column cursor
0160 ;position on graphics screen
0170 ;
0180 ROWCRS = $54
0190 COLCRS = $55
0200 ;
0260 ;location to use to select color
0270 ;register-plot & draw operations
0280 ;
0290 ATACHR = $02FB
0300 ;
0310 ;equates for IOCB locations
0315 ; (given for IOCB #0)
0320 ;
0330 ICCOM = $0342    ;command byte
0340 ICBAL = $0344    ;buf addr-lo byte
0350 ICBAH = $0345    ;buf addr-hi byte
0360 ICBLL = $0348    ;buf len-lo byte
0370 ICBLH = $0349    ;buf len-hi byte
0380 ICAX1 = $034A    ;auxiliary byte 1
0390 ICAX2 = $034B    ;auxiliary byte 2
0400 CIOV =  $E456    ;entry point to
0405 ;central I/O subsystem
0410 ;
0420 ;routine to open IOCB #6 as
0430 ;device "S:" (graphics screen)
0440 ;
0450 OPENSCREEN
0460     LDX #$60     ;offset to IOCB #6
0470     LDA #OPEN    ;command is OPEN
0480     STA ICCOM,X
0490     LDA #SCREEN&255 ;device to open
0500     STA ICBAL,X
0510     LDA #SCREEN/256
0520     STA ICBAH,X
0530     LDA #12      ;no text window
0540     STA ICAX1,X
0550     LDA #5       ;graphics mode 5
0560     STA ICAX2,X
0570     JSR CIOV     ;go do it
0580 ;
0590 ;begin by plotting one endpoint of
0600 ;the line segment, at 12,10
0610 ;
0620 PLOTPOINT
0630     LDA #12      ;X-coordinate is 12
0640     STA COLCRS
0650     LDA #10      ;Y-coordinate is 10
0660     STA ROWCRS
0670     LDX #$60     ;offset to IOCB #6
0680     LDA #PUTREC ;command is
0685 ;                 PUT a RECord
0690     STA ICCOM,X
0700     LDA #REG1&255 ;select color
0705 ;                 register 1
0710     STA ICBAL,X ;by "printing" a
0715 ;                letter "B"
0720     LDA #REG1/256 ;this is like
0725 ;                 a COLOR 2
0730     STA ICBAH,X ;statement in BASIC
0740     LDA #1       ;only print 1 char
0750     STA ICBLL,X
0760     LDA #0
0770     STA ICBLH,X
0780     JSR CIOV     ;go do it
0790 ;
0800 ;now set the other endpoint of the
0810 ;line segment, at 75,40
0820 ;
0830 ENDPOINT
0840     LDA #75      ;X-coordinate is 75
0850     STA COLCRS
0860     LDA #40      ;Y-coordinate is 40
0870     STA ROWCRS
0880 ;
0890 ;now use CIOV to connect the dots
0900 ;
0910 DRAWLINE
0920     LDX #$60     ;offset from IOCB#6
0930     LDA #DRAW    ;command is DRAW
0940     STA ICCOM,X
0950     LDA #2       ;select color
0955 ;register 1
0960     STA ATACHR
0970     JSR CIOV     ;go do it
1180 ;
1190 ; close the graphics screen
1200 ;
1210 CLOSESCREEN
1220     LDX #$60     ;offset to IOCB #6
1230     LDA #CLOSE  ;command is CLOSE
1240     STA ICCOM,X
1250     JSR CIOV     ;go do it
1260 ;
1270 STOP JMP STOP
1280 ;
1290 ;data values for text strings
1340 ;
1350 ;
1360 ;data values for text strings
1370 ;
1380 SCREEN .BYTE "S"
1390 REG0 .BYTE "A"
1400 REG1 .BYTE "B"
1410 REG2 .BYTE "C"
```

Listing 5.
Assembly listing.

```
10 ;Listing 5-Assemble Some Graphics
20 ;by Karl E. Wiegers
30 ;
0210 ;equates for color registers used
0220 ;
```

```
0230 COLOR0 = $02C4
0240 COLOR4 = $02C8
0250 ;
0590 ;begin by plotting the first point
0600 ;of the figure, at 20,15
0610 ;
0630     LDA #20      ;X-coordinate is 20
0650     LDA #15      ;Y-coordinate is 15
0700     LDA #REG0&255 ;select color
0705 ;                  register 0
0715 ;                  a letter "A"
0720     LDA #REG0/256 ;this is like
0725 ;                  a COLOR 1
0800 ;change colors to purple background
0810 ;and yellow lines
0830     LDA #104     ;purple into
0840     STA COLOR4   ;color register 4
0850     LDA #28      ;yellow into
0860     STA COLOR0   ;color register 0
0870     LDA #1       ;selects color
0875 ;                  register 0
0880     STA ATACHR
0890 ;
0900 ;routine to connect X,Y points
0910 ;from tables of coordinate data
0920 ;
0930     LDY #0       ;use Y as table
0935 ;                  offset pointer
0940 POINT
0950     LDA XDATA,Y ;no, get next
0952 ;                  x-coordinate
0955 ;
0960     STA COLCR5   ;goes in column reg
0970     LDA YDATA,Y ;get next
0975 ;                  y-coordinate
0980     STA ROWCR5   ;in row register
0990     TYA          ;save Y-register
1000     PHA
1010     JSR DRAWLINE ;draw from last
1015 ;                point to this one
1020     PLA          ;restore Y-register
1030     TAY
1040     INY          ;increment table
1045 ;                  offset pointer
1050     CPY #5       ;equal to 5 yet?
1060     BNE POINT    ;no, go for next
1065 ;                  point
1070     BEQ CLOSESCREEN ;yes, close
1075 ;                  screen and quit
1080 ;
1090 ;subroutine to draw from last
1100 ;plotted point to the current one
1110 ;
1120 DRAWLINE
1130     LDX #$60
1140     LDA #DRAW
1150     STA ICCOM,X
1160     JSR CIOV
1170     RTS
1280 ;
1290 ;data for plotting points, in two
1300 ;tables, one for X-coordinates and
1310 ;one for Y-coordinates
1320 ;
1330 XDATA .BYTE 60,28,40,52,20
1340 YDATA .BYTE 15,35,5,35,15
```


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CIRCLE #152 ON READER SERVICE CARD

Gemsets

A character set customizer for Gemini 10X/15X or Epson FX/JX/LQ

by Matthew J.W. Ratcliff

One of the most advanced features of Gemini 10X/15X and Epson FX/JX/LQ printers is the capability to redefine their character sets. This is a seldom used feature, since most computer systems do not support custom character sets easily. We Atarians, however, are old pros at it.

By creating a custom character set in a predefined format and sending it to the printer, along with the proper escape codes, virtually any character set may be used on these printers. Once enabled, program listings and word processor files can be printed with the custom set.

With a word processor like the **AtariWriter**, you can use the proper control codes to print text in superscript, subscript, condensed, emphasized, double strike and even double width—all with the custom character set. You may even toggle back and forth between the custom and normal printer sets, and you can also use the printer's built-in italics set to have up to three different print styles in one document. These capabilities can now be easily implemented with the program **Gemsets**.

Sets of another type.

After considering this capability for a while, I saw two possible approaches to the custom set handling. The Atari's own character sets are "horizontal" 8x8 grid bit maps. The Gemini requires a 7x9 "vertical" map, and the Epson FX series, an 8x11 map. See the figures below for a comparison between the Atari and Gemini maps.

The most obvious approach is to create a vertical map custom character set editor for these printers. Although workable, this would require you to recreate all your favorite character sets and take up valuable disk space for these unique vertical maps. The better—but more difficult—approach would be to write a program capable of putting standard Atari character sets into your printer.

After a little head scratching, I came up with **Gemsets**, a translator program to take any Atari character set file, convert it and install it in your printer.

Listing 1 is the BASIC data for **Gemsets**. Please refer to **M/L Editor** on page 35 for typing instructions. When you've typed the listing, the resultant file should be named AUTORUN.SYS. When booted up, **Gemsets** will request *[1] GEMINI 10X/15X or [2] EPSON FX/JX/LQ.* (Epson MX/RX series printers do not support the custom character set feature.)

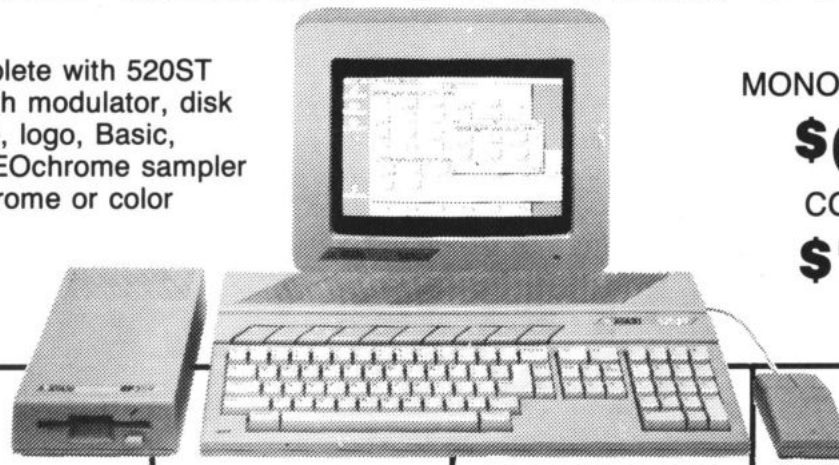
First, power down your printer and set top of form. Turn it back on and be sure it's on-line. Type the appropriate number key for your printer and press RETURN.

Gemsets will then list the disk directory to the screen and ask you for a character set filename. Type *filename extension* and press RETURN (drive defaulted to number one and cannot be changed). There are many error traps in the program, so it's unlikely that you'll ever crash it.

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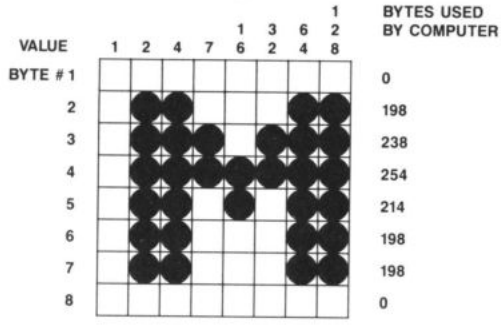
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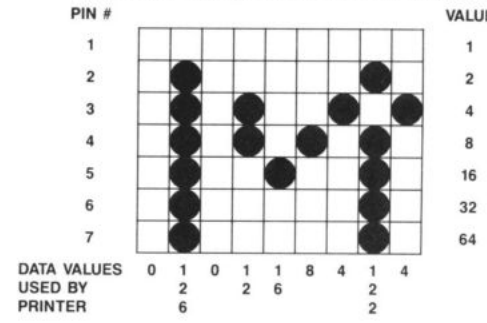
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CIRCLE #148 ON READER SERVICE CARD

Computer bit map for letter *M*.



Gemini 7×9 grid for redefined *M*.



The codes would appear similarly for the Epson FX printer.

Once a valid character set file is given, it will be loaded into RAM, translated from Atari to your printer's format, then downloaded to your printer—in 5 seconds! Any file not exactly 1024 bytes long will be flagged as invalid, and will restart **Gemsets**. This is the proper file size for an Atari character set file.

You will then be prompted to press START to exit or reboot the system with the word processor of your choice. The custom character set has been enabled on the printer, and any subsequent listings or word processor printouts will use it. Some word processors send the printer reset code (ESC @) before printing your file, in which case your custom set will be disabled.

With the Gemini, you need only send the ASCII codes (such as "very special characters" with LJK) to re-enable it. The Epson printers, however, will clear out the custom character set from its download RAM. As far as I know, LJK's **Letter Perfect** is the only word processor that does this.

Now any character set you have on your Atari can be used on the printer, as well. If you don't have a custom character set handy, one can be made to test **Gemsets**. RUN the following program from BASIC to make a file out of Atari's standard set.

```
10 GRAPHICS 0:OPEN #1,8,0,"D:ATARI.SET
"
20 FOR I=57344 TO 58367:PUT #1,PEEK(I)
:NEXT I
30 CLOSE #1:END
```

If you don't have a good character set editor, I highly recommend **Create-A-Font** by Vince Erceg, which appeared in **ANALOG Computing**'s issue 16.

Tips on the Gemsets utility.

You may wish to use **Gemsets** only occasionally, in which case you'll want to rename it. It can then be executed from a DOS binary load *(L)* function. Pressing START returns control to DOS after completing the download. This might be preferable, so that you can have character sets, **Create-A-Font** and **Gemsets** all on the same disk.

Gemsets was tested with Atari DOS 2.0S and OSS DOS-XL, both single and double density. I followed all the operating system rules, so it will run on all Ataris with 32K of RAM or more.

To change printer character sets within an **Atari-Writer** text file, you need to put in the proper CTRL-O (^O) ASCII codes (samples given for Gemini X series printers). To return to the normal printer set, place the following on a separate line (preceded and followed by a RETURN): *^O27^O36^O0*. To re-enable it, use: *^O27^O1*. To use the italics set, you must disable the custom set with the first command above, then use: *^O27^O52*. To return to normal: *^O27^O53*.

You can switch from normal to italics and vice versa on the same print line, but not to the custom set. The control codes must be on a separate line; otherwise, the printer will ignore the command and continue printing with the last set used. Apparently, the printer cannot print custom and normal sets on the same line.

Printer-set design.

You'll quickly find that most Atari sets look quite chubby on the printer. Your design philosophy for printer characters will change as you get more use out of **Gemsets**. Because of artifacting, Atari's charac-

ters commonly have vertical segments two dots wide; one is preferable on the printer.

You may notice "bumps" on the right side of some characters. This is due to a limitation imposed by the printer. Two consecutive dots on the same horizontal line cannot be "on," since the printhead cannot fire that fast. **Gemsets** looks for dual horizontal bits "set" and strips out the second one, searching left to right. If there is an odd multiple of bits set, the last one defining part of the rightmost column of the character, this bumping will occur. The sample figures below illustrate this limitation with the letter *M* from Atari's standard character set. This is not a serious constraint, once you get used to it.

Diagonal lines come out sharpest in the custom print characters.

When defining custom printer characters, use all of the 8×8 grid space. Use the top seven rows for upper case characters and lower case letters which don't have "descenders." Use the lower seven rows for characters which require descenders (i.e., *j, y, g, p* and *q*). The **Gemsets** software checks the bottom row bit map value and sets the lower case flag if it's nonzero. When this flag is set, the printer will use the lower seven pins (of nine) to print the character, rather than the usual upper seven.

The printer takes care of the horizontal and vertical character spacing for you, so use the full width of the grid for character editing. With **Create-A-Font**, you will find it a fairly simple task to modify existing character set files to look good on your printer.

A few pointers.

Gemsets only defines 96 ASCII characters (32-127), the maximum allowed by the Gemini. If you plan to list programs with a custom set which has inverse video characters, put a REM in the first line of your program. This forces the Gemini to a 7-bit interface (otherwise, inverse characters will not print). This REM line should have the escape character (press ESC twice), followed by the equal (=) sign. This will force inverse characters to print normally.

As some of you may know, **AtariWriter** allows an AUTORUN.SYS file on your text files disk. This is how printer drivers (formerly available through the now-defunct APX) work with Epson, Gemini and other printers (minimizing the need to use the ^O functions). **Gemsets** cannot be used this way, however.

AtariWriter allows an autorun file to boot up and change memory locations, setting up the program for certain printers. It *will not* allow the autorun file to take control of the keyboard or display, so **Gemsets** would lock up the computer.

This was done to protect the cartridge from being pirated. Therefore, **Gemsets** instructs you to reboot the system with your word processor, while keeping power on the printer to maintain the custom set just installed. There's no problem using it with an assembler or BASIC cartridge.

Epson owners may have deduced that I did not implement the full power of that printer, due to some Gemini limitations. The Epson allows you to define 255 characters, which means you could install inverse video characters, too. This would require an extra smart conversion routine, however, which handles ASCII characters greater than 127.

Footnotes.

All the above features—listed for the Gemini—are also available on the Epson. Study your printer manual and learn how to use these ESC codes to their full potential.

The custom printer character sets will greatly enhance the capabilities of your favorite word processor. I think that you'll find **Gemsets** a jewel of a utility to add to your library.

Matthew J.W. Ratcliff is an Electrical Engineer in St. Louis, Missouri. He's been programming in BASIC and assembly language on the Atari since 1982. He is also active in telecommunications and is a remote SYSOP on the Gateway BBS, (314) 647-3290.

Listing 1.
BASIC listing.

```
1000 DATA 255,255,0,52,251,52,124,68,4
9,58,42,42,42,42,42,42,9375
1010 DATA 42,42,46,42,42,42,0,0,0,0,0,
0,0,0,0,0,1904
1020 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,1020
1030 DATA 0,0,0,27,42,1,27,38,0,27,42,
0,27,36,1,27,3881
1040 DATA 58,0,0,0,27,37,1,0,0,83,58,0
,162,96,169,12,9107
1050 DATA 157,66,3,32,86,228,32,13,56,
162,96,169,3,157,66,3,2085
1060 DATA 169,67,157,68,3,169,52,157,6
9,3,169,0,157,75,3,73,1569
1070 DATA 16,9,12,157,74,3,32,86,228,1
69,2,133,82,169,39,133,4573
1080 DATA 83,169,0,141,198,2,32,176,56
,32,136,56,32,13,56,162,1721
1090 DATA 16,169,3,157,66,3,169,6,157,
74,3,169,0,157,75,3,1245
1100 DATA 76,163,52,68,58,42,46,42,0,1
69,157,157,68,3,169,52,2724
1110 DATA 157,69,3,32,86,228,152,16,3,
76,253,55,160,0,140,40,3582
1120 DATA 52,172,40,52,192,1,208,3,32,
24,56,192,2,208,8,32,1308
1130 DATA 101,56,160,0,140,40,52,162,1
6,169,5,157,66,3,169,0,1631
```

```
1140 DATA 157,68,3,169,6,157,69,3,169,
18,157,72,3,169,0,157,2806
1150 DATA 73,3,32,86,228,152,48,48,173
,16,6,201,155,208,5,169,6342
1160 DATA 32,141,252,52,247,53,16,6,16
2,0,169,11,157,66,3,169,3314
1170 DATA 0,157,68,3,169,6,157,69,3,16
9,17,157,72,3,169,0,1533
1180 DATA 157,73,3,32,86,228,238,40,52
,76,187,52,201,136,240,3,7478
1190 DATA 76,253,55,32,13,56,32,101,56
,162,4,160,57,32,55,56,496
1200 DATA 169,5,133,82,162,0,169,11,15
7,66,3,169,1,157,68,3,1600
1210 DATA 169,52,157,69,3,169,3,157,72
,3,169,0,157,73,3,32,693
1220 DATA 86,228,162,0,169,5,157,66,3,
169,4,157,68,3,169,52,2688
1230 DATA 157,69,3,169,17,157,72,3,169
,0,157,73,3,32,86,228,3314
1240 DATA 32,13,56,162,16,169,3,157,66
,3,169,4,157,74,3,169,2842
1250 DATA 0,157,75,3,169,1,157,68,3,16
9,52,157,69,3,32,86,1263
1260 DATA 228,152,16,3,76,253,55,169,2
,133,82,162,63,160,57,32,4107
1270 DATA 55,56,173,244,2,72,169,64,14
1,244,2,162,16,169,7,157,5935
1280 DATA 66,3,169,0,157,68,3,169,64,1
57,69,3,169,0,157,72,3070
1290 DATA 3,169,4,157,73,3,32,86,228,1
04,141,244,2,152,48,7,4123
1300 DATA 201,3,208,3,76,237,53,32,13,
56,162,75,160,57,32,55,2169
1310 DATA 56,32,226,56,76,70,52,32,13,
56,162,16,169,3,157,66,2053
1320 DATA 3,169,248,53,243,54,8,157,74
,3,169,0,157,75,3,76,2375
1330 DATA 7,54,80,58,0,169,4,157,68,3,
169,54,157,69,3,32,928
1340 DATA 86,228,152,16,3,76,253,55,17
3,66,52,208,21,162,51,160,6235
1350 DATA 52,169,3,32,147,56,162,54,16
0,52,169,3,32,147,56,76,2899
1360 DATA 70,54,162,57,160,52,169,5,32
,147,56,162,62,160,52,169,5435
1370 DATA 4,32,147,56,152,48,3,76,89,5
4,162,132,160,57,32,55,2725
1380 DATA 56,32,226,56,76,237,53,169,3
3,141,41,52,173,41,52,201,5528
1390 DATA 129,208,3,76,176,55,170,141,
40,52,224,96,176,12,169,64,6287
1400 DATA 224,32,144,2,169,224,24,109,
40,52,133,212,169,0,133,213,7844
1410 DATA 162,3,6,212,38,213,202,208,2
49,24,169,64,101,213,133,213,1796
1420 DATA 162,0,169,0,157,16,52,232,22
4,20,208,248,160,0,162,0,7180
1430 DATA 177,212,157,16,52,230,212,20
8,2,230,213,232,224,8,208,240,4783
1440 DATA 169,1,162,0,72,61,16,52,208,
8,160,0,140,44,52,76,1495
1450 DATA 217,54,172,44,52,200,192,2,2
08,13,73,255,61,16,52,157,5461
1460 DATA 16,52,160,0,140,44,52,104,10
,144,217,24,169,1,232,224,7700
1470 DATA 8,208,209,169,0,141,43,52,17
3,23,52,240,3,238,43,52,4847
1480 DATA 169,0,244,54,239,55,160,0,16
2,0,140,40,52,172,66,52,3626
1490 DATA 240,19,172,43,52,240,7,30,17
,52,42,76,35,55,30,16,8423
1500 DATA 52,42,76,35,55,172,43,52,240
,7,30,17,52,106,76,35,652
1510 DATA 55,30,16,52,106,172,40,52,23
2,224,8,208,205,153,25,52,7065
1520 DATA 200,192,8,208,195,173,66,52,
208,51,162,45,160,52,169,3,5946
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1530 DATA 32,147,56,152,16,3,76,253,55
,162,41,160,52,169,1,32,3341
1540 DATA 147,56,162,43,160,52,169,1,3
2,147,56,162,25,160,52,169,5127
1550 DATA 9,32,147,56,152,16,3,76,253,
55,76,170,55,162,48,160,5739
1560 DATA 52,169,3,32,147,56,152,16,3,
76,253,55,173,41,52,141,4439
1570 DATA 42,52,162,41,160,52,169,2,32
,147,56,173,43,52,240,5,4094
1580 DATA 169,11,76,149,55,169,139,141
,43,52,162,43,160,52,169,1,4549
1590 DATA 32,147,56,162,25,160,52,169,
11,32,147,56,238,41,52,76,3905
1600 DATA 94,54,76,180,55,155,162,16,1
69,9,157,66,3,169,179,157,6949
1610 DATA 68,3,169,55,157,69,3,169,1,1
57,72,3,169,0,157,73,3110
1620 DATA 3,32,86,228,32,13,56,169,1,1
41,240,2,32,136,56,162,4674
1630 DATA 182,160,57,32,55,56,173,31,2
08,201,7,240,249,169,0,141,9199
1640 DATA 240,2,240,55,235,56,169,148,
141,198,2,162,125,160,58,32,7164
1650 DATA 55,56,96,162,169,160,58,32,5
5,56,32,13,56,32,226,56,2245
1660 DATA 76,70,52,162,16,169,12,157,6
6,3,32,86,228,96,162,0,3860
1670 DATA 169,11,157,66,3,169,0,157,68
,3,169,52,157,69,3,169,3762
1680 DATA 1,157,72,3,169,0,157,73,3,32
,86,228,96,142,68,3,3084
1690 DATA 134,214,140,69,3,132,215,160
,0,140,72,3,140,73,3,177,4487
1700 DATA 214,201,4,240,11,238,72,3,20
8,3,238,73,3,200,208,239,478
1710 DATA 169,11,162,0,141,66,3,32,86,
228,96,76,105,56,155,162,5853
1720 DATA 0,169,9,157,66,3,169,104,157
,68,3,169,56,157,69,3,3239
1730 DATA 169,1,157,72,3,169,0,157,73,
3,32,86,228,96,162,212,7146
1740 DATA 160,58,32,55,56,32,101,56,96
,72,138,162,16,157,68,3,2479
1750 DATA 152,157,69,3,104,157,72,3,16
9,0,157,73,3,169,11,157,3631
1760 DATA 66,3,32,86,228,96,32,136,56,
162,30,160,59,32,55,56,2610
1770 DATA 162,203,160,59,32,55,56,32,2
26,56,201,49,240,14,201,50,6716
1780 DATA 240,16,162,250,160,59,32,55,
56,76,186,56,169,0,141,66,4706
1790 DATA 52,96,169,1,141,66,52,96,162
,0,169,5,157,66,3,169,3869
1800 DATA 0,157,236,56,231,57,68,3,169
,6,157,69,3,169,4,157,4156
1810 DATA 72,3,169,0,157,73,3,32,86,22
8,173,0,6,96,67,45,1999
1820 DATA 83,69,84,32,70,73,76,69,32,8
4,79,32,68,79,87,78,1217
1830 DATA 76,79,65,68,63,155,84,89,80,
69,32,102,105,108,101,110,4214
1840 DATA 97,109,101,46,101,120,116,32
,38,32,80,82,69,83,83,32,1277
1850 DATA 210,197,212,213,210,206,58,1
55,4,87,79,82,75,73,78,71,4936
1860 DATA 46,46,46,155,4,253,73,78,86,
65,76,73,68,32,67,72,2054
1870 DATA 65,82,65,67,84,69,82,32,83,6
9,84,32,70,73,76,69,1147
1880 DATA 33,155,80,82,69,83,83,32,82,
69,84,85,82,78,32,84,1825
1890 DATA 79,32,84,82,89,32,65,71,65,7
3,78,46,155,4,80,82,1581
1900 DATA 73,78,84,69,82,32,78,79,84,3
2,82,69,65,68,89,46,1111
1910 DATA 155,80,85,84,32,73,84,32,79,
78,32,76,73,78,69,32,601
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1920 DATA 38,32,80,82,69,83,83,32,210,
197,212,213,210,206,155,4,1021
1930 DATA 89,79,85,82,32,71,69,77,73,7
8,73,47,69,80,83,79,1775
1940 DATA 78,32,78,79,87,32,72,65,83,3
2,67,85,83,84,79,77,1779
1950 DATA 32,83,69,84,155,73,78,83,84,
65,76,76,69,68,32,38,1205
1960 DATA 32,82,232,57,227,58,69,65,68
,89,32,84,79,32,85,83,2506
1970 DATA 69,46,155,80,82,69,83,83,32,
211,212,193,210,212,32,84,9553
1980 DATA 79,32,69,88,73,84,44,32,79,8
4,72,69,82,87,73,83,1993
1990 DATA 69,155,89,79,85,32,77,65,89,
32,82,69,66,79,79,84,1972
2000 DATA 32,83,89,83,84,69,77,32,87,7
3,84,72,32,84,72,69,1503
2010 DATA 155,87,79,82,68,32,80,82,79,
67,69,83,83,79,82,32,1715
2020 DATA 79,70,32,89,79,85,82,32,67,7
2,79,73,67,69,44,32,503
2030 DATA 66,85,84,155,196,207,206,167
,212,160,212,213,210,206,160,207,7860
2040 DATA 198,198,160,208,207,215,197,
210,160,212,207,160,217,207,213,210,93
61
2050 DATA 160,208,210,201,206,212,197,
210,161,155,4,125,96,96,96,32,8508
2060 DATA 71,69,77,83,69,84,83,32,66,1
21,32,77,97,116,116,104,3887
2070 DATA 101,119,32,82,97,116,99,108,
105,102,102,32,96,96,96,155,5554
2080 DATA 29,29,29,29,29,155,4,73,47,7
9,32,69,82,82,79,82,1161
2090 DATA 155,80,82,69,83,83,32,210,19
7,212,213,210,206,32,84,79,150
2100 DATA 32,82,69,83,84,65,82,84,32,8
0,82,79,71,82,65,77,2107
2110 DATA 155,4,125,160,199,197,205,20
1,206,201,175,197,208,211,207,206,8720
2120 DATA 160,195,228,58,223,59,200,19
3,210,193,195,212,197,210,160,211,7785
2130 DATA 197,212,160,204,207,193,196,
197,210,160,155,160,160,160,160,160,55
83
2140 DATA 194,249,160,205,225,244,244,
232,229,247,160,202,174,160,215,174,95
11
2150 DATA 160,210,225,244,227,236,233,
230,230,160,160,160,160,160,155,4,4462
2160 DATA 170,160,215,201,204,204,160,
206,207,212,160,215,207,210,203,160,86
70
2170 DATA 215,201,212,200,160,210,216,
175,205,216,160,211,197,210,201,197,91
60
2180 DATA 211,170,155,155,84,117,114,1
10,32,111,102,102,32,121,111,117,6007
2190 DATA 114,32,112,114,105,110,116,1
01,114,44,32,38,32,115,101,116,3636
2200 DATA 32,116,111,112,32,111,102,15
5,102,111,114,109,46,32,32,84,3485
2210 DATA 104,101,110,32,112,111,119,1
01,114,32,105,116,32,117,112,32,3980
2220 DATA 97,103,97,105,110,32,97,110,
100,155,118,101,114,105,102,121,6913
2230 DATA 32,116,104,97,116,32,105,116
,32,105,115,32,111,110,32,108,3807
2240 DATA 105,110,101,46,155,155,219,1
77,221,32,71,69,77,73,78,73,5985
2250 DATA 32,49,48,88,47,49,53,88,155,
219,178,221,32,69,80,83,6585
2260 DATA 79,78,32,70,88,47,74,88,47,7
6,81,155,4,84,89,80,2592
2270 DATA 69,32,84,72,69,32,65,80,80,8
2,79,80,82,73,65,84,2351
2280 DATA 69,32,224,59,8,60,35,32,75,6
9,89,155,65,78,68,32,1895
2290 DATA 80,82,69,83,83,32,160,210,19
7,212,213,210,206,160,155,4,2543
2300 DATA 253,49,32,79,82,32,50,32,79,
78,76,89,33,155,4,224,3909
2310 DATA 2,225,2,70,52,0,0,0,0,0,0,0,
0,0,0,0,3308
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CIRCLE #155 ON READER SERVICE CARD

tered, SAVE it back to disk or cassette.

```
22 REM ■    revised by Kim
Gold     ■
24 REM ■         FEB. 86
         ■
26 REM ■    CANADIAN  VERS
ION      ■
160 NA$=A$(P*74-73,P*74):F
OR X=N1 TO N20:IF NA$(X,X)
<>" " THEN NEXT X
360 P=USR(ADR(FND$),ADR(A$
),CNT,74,ADR(T$),LEN(T$)):
FLAG=N0:RETURN
390 POSITION N9,N10:? "---
-----------,----      ":
POSITION N9,N11:? "-------
":RETURN
440 POSITION N9,N10:? C$:P
OSITION N25,N10:? NA$(64,6
7):POSITION N9,N11:? NA$(6
8)
480 IF EDIT AND T$="" THEN
 POSITION COL,ROW:? CHR$(B
):T$=A$(P*74-73,P*74-50):G
OTO 530
560 IF EDIT AND T$="" THEN
 POSITION COL,ROW:? CHR$(B
):T$=A$(P*74-49,P*74-N26):
GOTO 580
610 IF EDIT AND T$="" THEN
 POSITION COL,ROW:? CHR$(B
):T$=A$(P*74-N25,P*74-N11)
:GOTO 630
640 POSITION N1,N16:? "
enter province"
650 COL=N25:ROW=N10:L1=N4:
GOSUB 250
660 IF EDIT AND T$="" THEN
 POSITION COL,ROW:? CHR$(B
):T$=A$(P*74-N10,P*74-N7):
GOTO 680
670 IF LEN(T$)<N2 THEN POS
ITION N25,N10:? T$;"-":GOS
UB 120:GOTO 650
680 NA$(64,67)=T$:RETURN
690 POSITION N1,N16:? "ent
er postal code"
700 COL=N9:ROW=N11:L1=N7:G
OSUB 250
710 IF EDIT AND T$="" THEN
 POSITION COL,ROW:? CHR$(B
):T$=A$(P*74-N6):GOTO 750
720 IF LEN(T$)<N7 THEN POS
ITION N9,N11:? T$;:FOR X=L
EN(T$)+N1 TO N7:? "-";:NEX
T X:GOSUB 120:GOTO 700
730 REM THESE TWO LINES MU
ST BE
740 REM DELETED FROM ORIGI
NAL PROGRAM
750 NA$(68,74)=T$:RETURN
1050 LPRINT "  ";C$;", ";N
A$(64,67):LPRINT "  ";NA$(
68)
1090 LPRINT LN$;", ";FN$;"
   ";AD$;"   ";C$;", ";NA$
(64,67);" ";NA$(68):LPRINT
1300 NA$=" ":NA$(74)=" ":N
A$(2)=NA$:GOSUB 460:GOSUB
540:GOSUB 590:GOSUB 640:GO
SUB 690
1310 POSITION N1,N16:? "
EVERYTHING OK?  "
1350 IF CNT>N1 THEN A=USR(
ADR(SORT$),ADR(A$),74,24,C
NT)
1510 IF P=CNT THEN A$=A$(N
1,(P-N1)*74):CNT=CNT+N1:GO
TO 760
1520 A$(P*74-73)=A$((P+N1)
*74-73):SVE=N1:CNT=CNT-N1:
GOTO 760
1600 NA$=" ":NA$(74)=" ":N
A$(N2)=NA$
1610 GOSUB 460:GOSUB 540:G
OSUB 590:GOSUB 640:GOSUB 6
90:POSITION N1,N16:? "  EV
ERYTHING OK?  "
1640 A$(P*74-73,P*74)=NA$:
SVE=N1:IF CNT=N1 THEN A=US
R(ADR(SORT$),ADR(A$),74,24
,CNT)
1680 FOR X=N1 TO CNT:? #N1
;A$(X*74-73,X*74):NEXT X:C
LOSE #N1
1850 DIM A$(NA*74),NA$(74)
,T$(N25),B$(38),N$(N25),AD
$(N25),C$(N15),S$(N4),Z$(N
10),FND$(75),SORT$(152)
1900 INPUT #N1;NA$:CNT=CNT
+N1:A$(CNT*74-73,CNT*74)=N
A$:GOTO 1900
2050 DATA YOUR NAME,YOUR A
DDRESS,CITY,PROV,POSTALCOD
E
2060 POSITION N1,N1:? N$:?
 AD$:? C$;", ";S$:? Z$
```

Note: This will now use 74 characters per field. Therefore, it is not compatible with the data from the original **Micro-Mail**. If you have a file on your disk called ADDRESS.DAT, delete if before running the revised **Micro-Mail**, or it will not work properly.

Sincerely,
Mr. Kim Gold
Stoney Creek, Ontario, Canada

Still more on Graph E's.

The change to **Graph E's** (issue 21) published in the March 1986 **Reader Comment** (issue 40), is very useful, but you can't rerun the program, since it overwrites the ML routine in Lines 1530-1680 of the original program. I think the easiest way around the problem is to relocate the print routine to the 128-byte block available at $480. This can be accomplished by changing the following lines:

```
3620 RESTORE 3710:FOR B=1
TO 113:READ N:POKE 1151+B,
N:NEXT B:DM=PEEK(88)+PEEK(
89)*256:DM=DM+7640
3625 REM
3680 W=USR(1152,X,ADR(A$),
ADR(B$))
3725 DATA 233,40,133,202,1
44,13,76,151,4,230,207,76,
191,4,230,207,76,195,4,198
,203,76,151,4,230,205
3726 DATA 76,199,4,230,205
,76,203,4,96
```

Sincerely,
William V. Webb
Akron, OH

XL Load*It.

Although **Load*It** (issue 39) is a fine utility, I was unable to use it with BASIC XL in my 800XL. Apparently, when the cartridge initialized, the AUTORUN.SYS file was bypassed. The following lines of code correct the problem:

```
550 DATA 255,255,0,6,77,6,
173,31,208,41,4,240,10,169
,18,141,33,3,169,6,141,34,
3,96,251,243,51,246,33,6,1
63,246
560 DATA 51,246,60,246,76,
228,243,0,238,33,6,172,33,
6,192,18,208,10,169,0,141,
33,3,169,228,141,34,3,185,
59,6
570 DATA 160,1,96,82,85,78
,32,34,68,58,76,79,65,68,7
3,84,46,66,65,83,155,226,2
,227,2,0,6,224,2,225,2,17,
6,-1
```

I hope this will be useful to readers lucky enough to have BASIC XL.

Ken Moffat
Seattle, WA

More DLI Maker corrections.

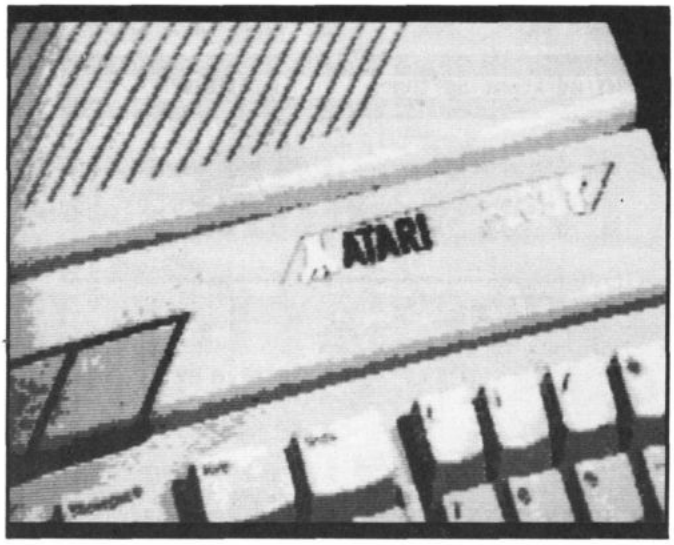
Here in the U.K., we get **ANALOG Computing** more than a little late at times, so you have probably already printed corrections for **DLI-Maker** from issue 38. But just in case you haven't. . .

```
60 REM the following modif
ications
65 REM remove any CHR$(34)
 and (155)
70 REM characters, which w
ill cause
75 REM errors in subroutin
e.
125 DIM PARM(100),KW(5,2)
1212 N=0:FOR I=1 TO LEN(DL
I$):KEN=ASC(DLI$(I,I))
1214 IF KEN=34 OR KEN=155
THEN KW(N,1)=I:KW(N,2)=KEN
:DLI$(I,I)=CHR$(0):N=N+1
1216 NEXT I
1262 IF N=0 THEN 1270
1264 ? #K1;"11090 ";:IF N>
1 THEN FOR I=0 TO N-2:? #K
1;"DLI$(";KW(I,1);",";KW(I
,1);")=CHR$(";KW(I,2);")":
:NEXT I
1266 IF N>0 THEN ? #K1;"DL
I$(";KW(N-1,1);",";KW(N-1,
1);")=CHR$(";KW(N-1,2);")"
```

Ken Ward
Norwich, U.K.

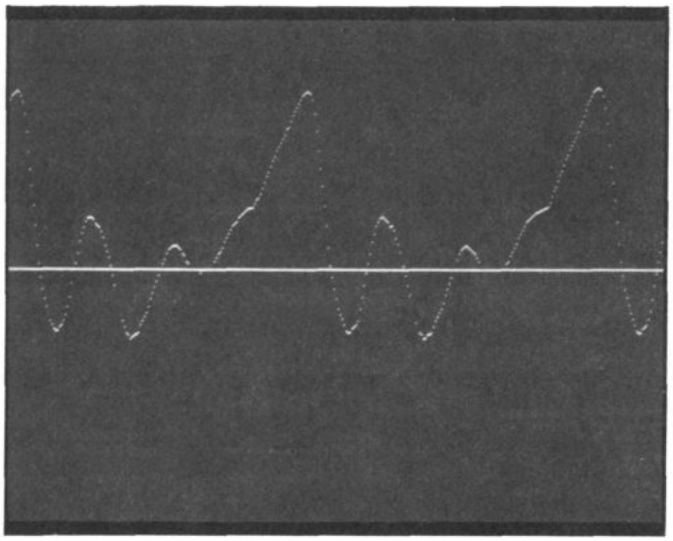
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CIRCLE #156 ON READER SERVICE CARD

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```
10 A="LIre
20 ? "help"
```

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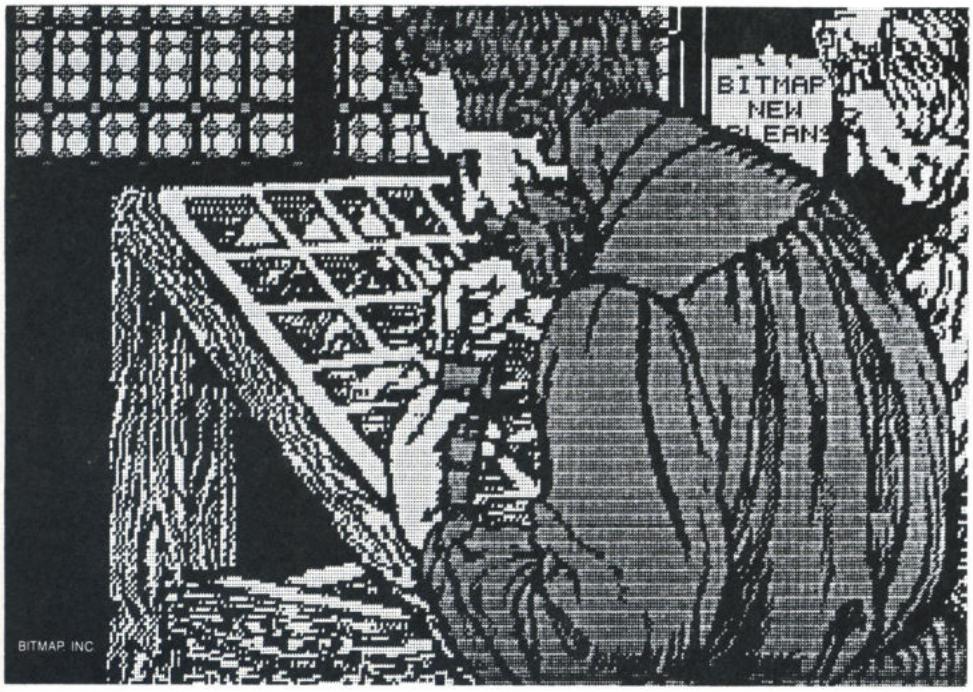
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CIRCLE #157 ON READER SERVICE CARD



Printing Utility

by Jan Iverson

Anything that's in ASCII format can be printed to the screen or printer by using DOS copy function. But why go to DOS, when a small utility program will do?

If you have a word processor like **PaperClip** or **SpeedScrip 3.0**, or any word processor that has the capabilities of printing to disk, you can print your files to disk, then call them up again to print to the screen or printer just as you saved them.

This utility assumes that your word processor has the default of a 75-character line length for a hard copy. Print to the disk under the name PRINT.PRT.

For the screen copy, remove any centering commands and manually center these items. All other commands will be inoperative when printed to the screen. Format the text as follows: left margin(1), right margin(39). Print the text to the disk as PRINT.SCR.

After typing in this utility, save it to disk. If you have any AUTORUN.SYS maker, put it on the disk to autorun your utility.

For many of my programs, I like to type in the instructions and save the text to the back side of the disk with this utility. Then, when I give it to friends. they don't have to worry about what kind of word processor to use. Also, this would be an alternate way of sending letters through the mail for any of your Atari-owning friends.

Jan Iverson is an applications programmer with Chevron Corp. She's been working with computers for eighteen years and is program chairman for her local user's group (DACE). She lives in Antioch, California, with her husband and three children.

Listing 1.
BASIC listing.

```
10 REM *** DOCUMENT PRINT UTILITY ***
20 REM *** by Jan Iverson 1985 ***
30 DIM A$(75),B$(39)
40 LNCNT=0
50 GRAPHICS 0:TRAP 40000:TRAP 400
60 CLOSE #3:OPEN #3,4,0,"K:"
70 DL=PEEK(560)+PEEK(561)*256+4:POKE D
L-1,66:POKE DL+3,7:POKE DL+7,6:POKE DL
+11,6:POKE DL+15,6
75 POKE 710,144:POKE 712,144:POKE 752,
1
80 POSITION 3,2:? "documentation"
90 POSITION 25,5:? "printing"
100 POSITION 7,9:? "P":GOSUB 460:POSIT
ION 8,9:? "R":GOSUB 460:POSITION 9,9:?
 "E":GOSUB 460
110 POSITION 10,9:? "S":GOSUB 460:POSI
TION 11,9:? "S":GOSUB 460
120 POSITION 27,12:? "s":GOSUB 460:POS
ITION 28,12:? "t":GOSUB 460:POSITION 2
9,12:? "a":GOSUB 460
130 POSITION 30,12:? "r":GOSUB 460:POS
ITION 31,12:? "t":GOSUB 460
140 POSITION 5,16:? "Ezuse Software Co
mpany (C) 1985"
150 IF PEEK(53279)<>6 THEN 150
160 GRAPHICS 0:POKE 752,1:? "  PRINT T
O (S)SCREEN OR (P)PRINTER"
170 GET #3,A
180 IF A=ASC("P") THEN 210
190 IF A=ASC("S") THEN 270
200 GOTO 170
210 CLOSE #1:CLOSE #2:OPEN #1,8,0,"P:"
:OPEN #2,4,0,"D1:PRINT.PRT"
220 TRAP 40000:TRAP 260
230 INPUT #2,A$
240 ? #1;A$
242 LNCNT=LNCNT+1
244 IF LNCNT=66 THEN GOSUB 470:LNCNT=0
:GOTO 255
250 GOTO 230
255 IF PEEK(764)=33 THEN POKE 764,255:
? "R":GOTO 230
256 IF PEEK(764)=28 THEN POKE 764,255:
GOTO 40
258 GOTO 255
260 CLOSE #1:CLOSE #2:GOTO 40
270 TRAP 40000:TRAP 420
280 CLOSE #2:OPEN #2,4,0,"D1:PRINT.SCR
":POKE 752,1:? "R"
290 INPUT #2,B$
300 POSITION 0,LNCNT:? B$
310 LNCNT=LNCNT+1
320 IF LNCNT=21 THEN LNCNT=0:GOTO 340
330 GOTO 290
340 GOSUB 470
350 IF PEEK(764)=33 THEN POKE 764,255:
? "R":GOTO 290
360 IF PEEK(764)=28 THEN POKE 764,255:
GOTO 40
370 GOTO 350
400 POKE 752,1:? "R"
410 POSITION 10,10:? "TURN ON YOUR PRI
NTER":FOR I=1 TO 500:NEXT I:GOTO 50
420 GOSUB 470
430 IF PEEK(764)=33 OR PEEK(764)=28 TH
EN POKE 764,255:GOTO 40
450 GOTO 430
460 FOR I=1 TO 22:SOUND 0,I+45,10,8:NE
XT I:SOUND 0,0,0,0:RETURN
470 POSITION 1,22:? " Press SPACE to c
ontinue/ ESC to quit ":RETURN
```


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CIRCLE #158 ON READER SERVICE CARD

CHECKSUM DATA.
(see page 12)

```
10 DATA 970,968,218,763,406,611,538,75
5,612,282,360,950,113,101,48,7695
150 DATA 832,194,565,70,88,706,730,884
,9,258,396,177,711,441,607,6668
258 DATA 730,681,893,810,30,603,387,17
0,725,985,444,606,727,443,926,9160
420 DATA 981,457,719,119,160,2436
```

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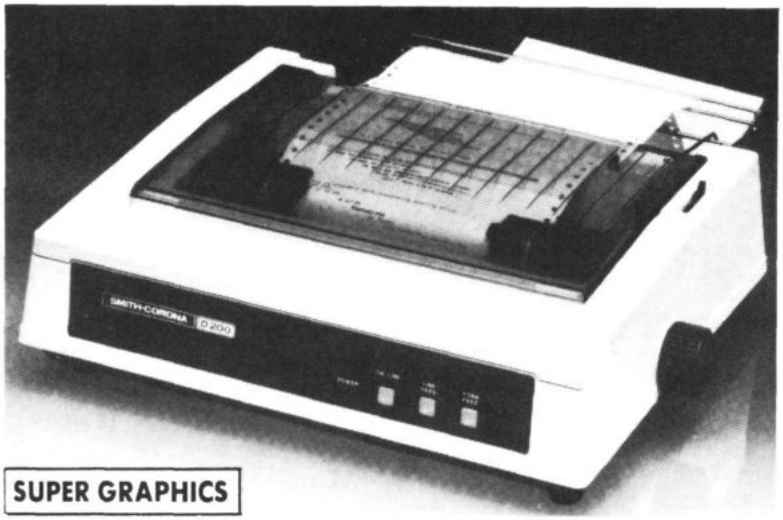
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THE END USER

THIS MONTH:

An 8-bit color organ/ game controller, new ST languages and consumer regrets

by Arthur Leyenberger

Were you around in the late sixties. . . you know, the "psychedelic era"? Gosh, just the thought of black lights, Day-Glo colors and lava lamps takes me back to my innocent youth. Things were simple then. No personal, micro- or home computers to use, learn about and enjoy. We just had rock and roll, Boss 302 Mustangs and color organs.

Do *you* remember color organs? If you've forgotten—or think by now that I've finally lost my mind—I'll fill you in. A color organ is an electronic gizmo to turn sound into light. Well, actually, there's more than magic involved. A microphone converts sound into an electrical signal whose varying voltage is used to modulate one or several lights.

The fancy color organs of those days had several channels, each corresponding to a different frequency range. To the viewer, this meant bass notes might be represented by blue lights, mid-frequencies by green lights and high frequencies by red lights. To see one of these color organs in action, accompanied by loud rock music (it would also work with normal music, but who would bother?) was something best described as, well, far out.

A decade later, Atari was selling a product which did essentially the same thing. Instead of using Christmas tree lights strung inside a large box with a fresnel lens, the Atari product sent the output to your TV. Various patterns could be displayed on-screen, and the sound of the music would vary the intensity (brightness) of the picture. True Atari historians will know the name of this product.

Here it is, roughly another decade later, and we have another improvement on the basic color organ idea. (I'll bet you were wondering what I was leading up to, huh?) The **Sound Mouse**, by Soundsoft, Inc., is a color organ that uses the Atari 8-bit computer to display a graphic image on your TV or monitor screen. Movement of the graphics image is synchronized to the beat of the music.

Sound Mouse is a peripheral that allows your Atari to be controlled by sound. You can use it as a color organ or as a game controller. As a color organ, it functions as described above. As a controller, sounds like your voice or a clap can control on-screen activities.

Sound Mouse requires at least 48K of memory and connects to the computer's joystick port. Hardware consists of a microphone and electronics to input the proper signal to the joystick port. A sensitivity control on the unit itself allows you to tailor its use to the volume of the sound source.

The software consists of eighteen different graphics displays—including spirals, spheres, stars and snowflakes. These images may be displayed one at a time or shown continuously, via the

Arthur Leyenberger is a human factors psychologist and free-lance writer living in New Jersey. He has been an Atari enthusiast for four years. When not computing, he enjoys playing with robotic toys.

demo program. How fast the display colors change, the direction of movement, and how long a given display is shown can also be controlled by the user.

Although **Sound Mouse** will generally respond to all types of music, it performs best with music that has a pronounced bass beat. The effect is heightened by turning down the monitor screen brightness and room illumination.

Nine sound-controlled games are provided on the disk. Although the games aren't necessarily of commercial quality, they represent an interesting collection of challenges. All operate on the same theme, that is: you must make a noise at a certain instant to fire a "laser canon," squash bugs, measure your reaction time, or move a man in a maze.

One of the best aspects of **Sound Mouse** is that you can create your own graphics screens. Any graphics 10 screen will work, and the manual provides a short program that will save a user-created graphic screen to disk.

All in all, **Sound Mouse** is an interesting diversion. Not only is it a conversation piece, but it will bring back golden memories of color organs—to those who lived through that era.

Sound Mouse retails for $29.95, from Soundsoft, Inc., Box 740, 10 Maple Avenue, Andover, NJ 07821.

Get the Raid!

The ST computer is becoming quite commonplace now. It's appearing in more homes, and the users are getting quite a bit of keyboard time under their collective belts.

TOS, the 520ST operating system, has been through a couple revisions, unbeknownst to users, and has settled down. But there are still a few bugs.

A comparison is often made between the Apple Macintosh and the Atari ST. Aside from the nonconstructive, "my computer is better than your computer" type of diatribe, it's worthwhile to look at the two machines and understand how each one implements certain features.

In this case, we're talking about how the computer either knows or doesn't know what disk is in the disk drive.

On the Mac, once a disk's been inserted into the drive, the user has lost control over its removal. The Mac's OS decides when it's safe to "eject" the disk, much like a toaster does with your morning toast.

The user *may* remove a disk, by selecting an item on a pull-down menu; out comes the disk. With this method, the Mac's OS always knows when a disk is in the drive—and what disk it actually is.

On the other hand, the Atari ST's OS doesn't know—or care—if a disk is in the disk drive. It may be the right disk, or it may be the wrong disk; it's immaterial to TOS.

Therein lies the problem. If you switch a disk on the ST during some type of disk operation (for example, a disk write), you could easily scramble the contents of that disk.

Here's an example of what *not* to do. Suppose you're using **ST-Writer** and have the program disk in the drive. The disk is write protected, because you don't want to accidentally erase or overwrite any of those files.

If you tell **ST-Writer** to save your file, you'll get a message in a dialog box saying that the disk is write protected. If, at that point, you (trying to be clever) insert the disk that you *really* want the file to be on, **ST-Writer** will save the file—but mess up the disk directory; it will look like the program disk's directory.

The bottom line is: don't *ever* switch disks in the middle of a disk operation, especially not a disk write operation. If you do. . .Well, you *did* back up the disk, didn't you?

Second FORTH.

Many Atari ST users know that the FORTH language is a very powerful, low-level computing language. "Low level" means it's optimized for the computer, rather than for humans.

This indicates that the language is a little more difficult to learn, but is much more powerful and faster than, say, BASIC. The Dragon Group, a small, West Virginian systems house, was the first company to market a product for the ST computer—**4xFORTH**.

The Dragon Group has announced that, after several months on the market, the original has been upgraded. Version 2 of **4xFORTH** is now available.

Extensive changes have been made for this new edition of the language. About one hundred new words have been added to the core FORTH vocabulary, including double precision integer math and printer control words. Also, the language now runs 25 to 30 percent faster than before.

Documentation has been upgraded, too. Changes in the manual include: 70 pages of new material, a 15 percent larger typeface for easier reading and a complete reworking of the contents.

The folks at the Dragon Group tell me that version 3 of **4xFORTH** is just about ready, as well. They claim that version 3 will be a milestone for FORTH languages; it's a self-optimizing system where the degree of optimization is controlled by the user.

According to the company, using the default level of optimization results in a halving of the *Byte* magazine Seive benchmark—from 19 to 10.26 seconds. The time for a million empty loops has dropped from 9.25 to 3.1 seconds.

Programming in FORTH is not for everyone; it uses a slightly different method of program statements and operators.

But, if you'd like to try programming in a powerful language—one which, according to the Dragon Group, has just become even *more* powerful, **4xFORTH** is worth investigating.

Speaking of Languages Dept.

If you're disgusted with ST-BASIC and ST-LOGO like I am, you'll be happy to learn that two additional languages have recently become available for the Atari ST. These just arrived, and I have not yet had time to start programming in either one. Still, I can assure you: each is an improvement over the "freebie" languages that come with your ST computer.

Optimized Systems Software has long been a supporter of the 8-bit Ataris. They publish several fine languages — Action!, BASIC/XL and MAC-65, to name a few. Their **Personal Pascal** is a complete development system.

It goes beyond the standard Pascal, because it has extensions designed especially for the ST computer. Some features included in **Personal Pascal** are: GEM support, debugging options, code optimizer, compatible strings and an easy-to-use command to automatically perform compiling and linking.

Personal Pascal is OSS's first ST product and lives up to their usual standards in every way. The almost 300-page manual describes the built-in editor, GEM/Pascal library, compiler and linker, in a readable (and occasionally entertaining) way. Plenty of examples are used to illustrate the various topics presented. **Personal Pascal** costs $80 and is available now, from Optimized Systems Software, 1221B Kentwood Avenue, San Jose, CA 95129 — (408) 446-3099.

The other recently introduced language for the 520ST is **Fast/BASIC-M** from Philon. What makes this programming language unique is that it's a compiled version of BASIC, closely resembling MicroSoft BASIC.

In addition to extremely fast execution of compiled code, **Fast/BASIC-M** features include the ability to perform calculations using either the highly accurate, binary-coded decimal format (BCD) or the high-speed IEEE standard format. Further, the separate compilation facility allows for modularization of code. Large applications can be broken down into modules which are individually compiled and recompiled as necessary, then linked together to form a complete program.

In this version of BASIC, array range checking can be turned on or off. User-written run-time libraries may be incorporated in programs, and the symbol table may be removed from the executable file, to keep down its size. On top of all this, the source code may be prepared for use with other Philon program development aids.

A 200-page manual accompanies the five disks. The documentation seems complete, containing sections on lexical rules, variables and constants, expressions, control statements, input/output, program segmentation, compiler operations and more. Appendices include: keywords, function table, run-time error codes, differences from other BASICs and Philon assembler documentation.

Philon's **Fast/BASIC-M** sells for $129 and is available now, from Philon, Inc., Atari Division, 641 Avenue of the Americas, New York, NY 10011 — (212) 807-0303.

They've done it again!

Well, almost time to say good-bye once again. Just a minute, though; I've got one more thing to mention this month. First, let me take my blood pressure pill. Gulp, gulp, gulp. Okay, I'm ready now.

I've long respected *Consumer Reports* magazine, published by Consumers Union. For years, I haven't bought so much as a single toaster oven, dryer or electric razor without first consulting them. My balloon was burst a couple years ago, when they began preaching the Commodore dogma with nary a mention of the Atari 8-bit computer.

It seemed that nobody at *Consumer Reports* was savvy enough to realize that the Atari was easier to use, had just as much software, provided better graphics and sound, and was generally a better value than either the Apple or the Commodore 64.

Then they wised up. In 1985, the pronounced **AtariWriter** the best word processor for home use. . .a little late, but recognition, nonetheless. Now it seems that the folks at Consumers Union are up to their old tricks. Take the review of the Commodore 128 computer in their February 1986 issue—please.

After admitting that the C128 costs $1100 for a full system with printer, the article goes on to recommend an Apple IIc or an IBM PCJr for people considering spending $1000 to $1500. No mention of the Atari 130XE or 520ST as alternatives can be found.

In a sidebar titled "Looking for a High-Tech Doorstop," *Consumer Reports* says, "A computer without software is no more useful than a doorstop." That's good advice, except they failed to look very hard for ST software. As of Christmas 1985, when they "found a number of games and word processing programs for the ST," there were dozens of titles available.

Based upon my own knowledge of locally available ST software, one could choose from five different word processors, four languages, at least five telecommunications programs, an excellent painting program, a couple dozen text and arcade games, and a host of utility, database and miscellaneous programs.

If *Consumer Reports* had done their homework, they would have had correct information for that issue.

By recommending a discontinued computer (the IBM PCJr) and an overpriced 8-bit model (the Apple IIc), *Consumer Reports* has, once again, demonstrated that they know irons and toasters far better than they do computers. In fact, given their less-than-average attempt at researching the computer market, I'm not sure I trust them with toasters anymore.

Since *Consumer Reports* accepts no advertising, we can't blame this blindness on their recommending only products advertised in their pages, as some magazines do. No, I guess the product testers at Consumers are just ignorant of what's happening in the computer market and what makes good sense.

For someone starting out in computing, who's willing to pay about $1000 for a system, buying the 520ST is a smart move. High-powered processors like the 68000, icon-based user interfaces like GEM and inexpensive megabyte RAM memory are the wave of the future. *Anyone* who tells you differently is simply wrong.

Happy anniversary.

Congratulations to all you **ANALOG Computing** readers who enjoy reading the **End User** each month. This issue's column marks the start of our second year. Quite honestly, I enjoy bringing you news, information and, er, controversy each month.

As a computer advocate, I believe you have the right to get as much use, fun and enjoyment out of Atari computing as possible. That's why you're here each month. That's why I'm here. Until next time, have a good one.

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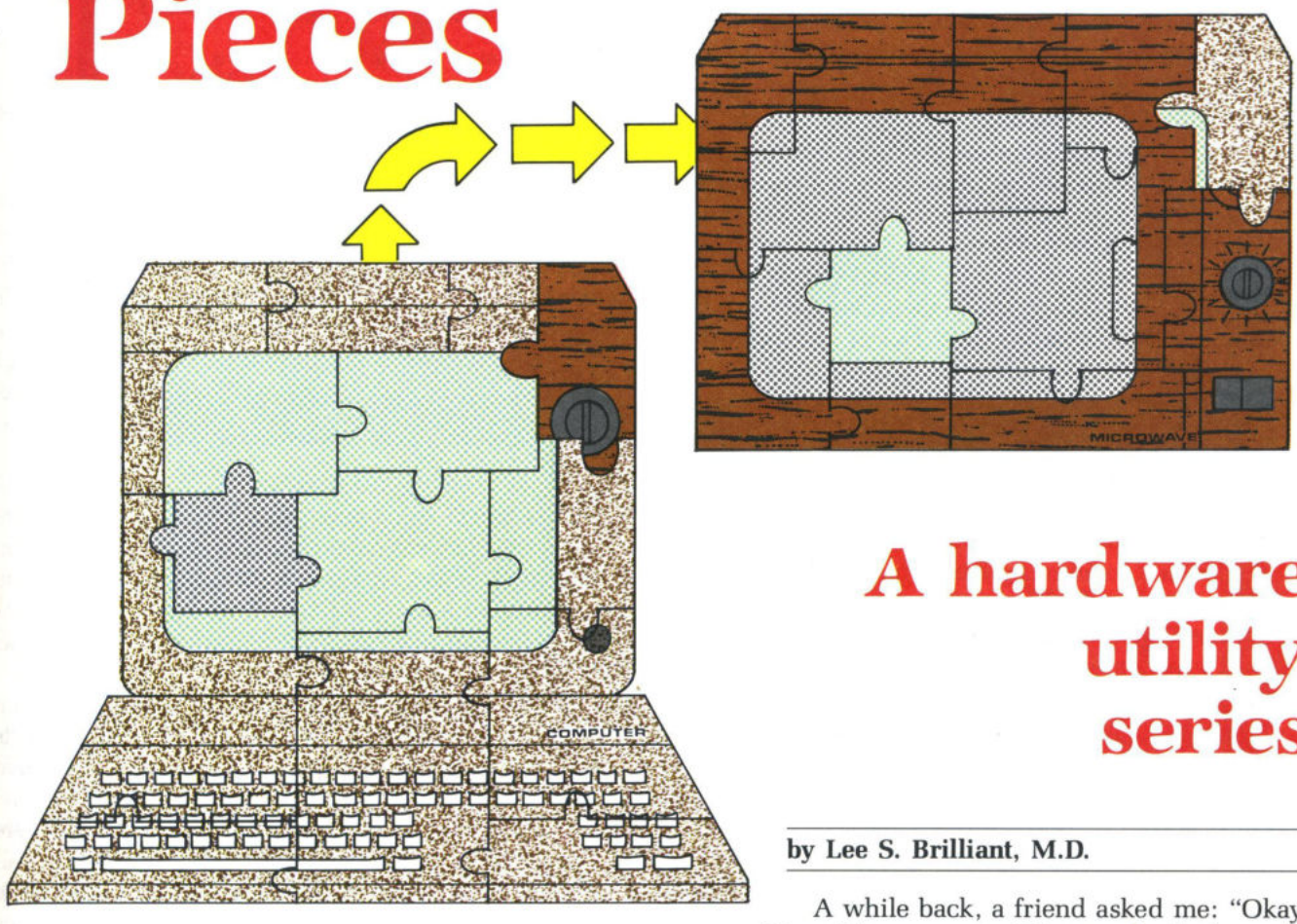
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CIRCLE #151 ON READER SERVICE CARD

Bits & Pieces



A hardware utility series

by Lee S. Brilliant, M.D.

A while back, a friend asked me: "Okay, so I buy this computer. What can it do for me?"

"Well," I answered, "It can do lots of things—keep your checkbook balance, do word processing, play games. . ."

"Yeah, yeah, I know, but I have an adding machine and a typewriter—I want to know what my computer can *do!*"

What people really want to know is just what kind of *appliance* this computer device is. As a typewriter used for occasional correspondence, it's overly complex; as a pocket calculator, it's way over-priced.

So what can the computer *do*? With proper programming, it can manipulate words and numbers. Still, the real power of the inexpensive home computer cannot be realized without connecting it to the *real world*. Sure, a modem lets you reach out to other places, but what real-world work can your computer do without connection to everyday things? The computer can't turn a light on or off, warm up your coffee before you wake up or regulate your furnace for maximum efficiency. Or can it? Hooking up your Atari to do these things isn't that difficult—if you understand how it works.

The problem in building attachments is that most people don't know the basic lingo, or they lack the essential knowledge needed to do even simple electronic projects. Or, they're afraid to try for fear of hurting themselves (or their computers). Courses offered at local schools often don't cover the essential material needed.

But, never fear, all is possible! The purpose of this column is to introduce you to the world of digital electronics and give you a deeper understanding of how your Atari functions. Along the way, we'll construct several

simple but useful projects to allow your computer to connect to the real world and do jobs for you.

The things a computer can do are limited only by your imagination, but some examples might give you a few ideas. Using a single joystick connection, you can turn up to sixteen appliances on or off.

You could set it up to run your sprinklers when the moisture content of the ground is too low. A security system built around a computer could turn lights and radios on and off randomly, within any pattern of times you choose. In fact, it could open and close the garage door (to add to the lived-in effect) or it could monitor all your windows and doors, then call your mother if someone breaks in and talk to her—at the same time it turns the heat up before you get home. Sound a bit far-fetched? Not at all. Interested? Let's get started.

Getting started.

Because a good working knowledge of BASIC (along with a smattering of machine language) will be needed, this series may be a bit advanced for beginners, but it shouldn't be beyond the scope of anyone interested in learning more about their Atari. It would also help to have some experience in electronics (soldering, etc.), but the most important thing needed is an insatiable desire to *tinker*.

To get started, we need to review the binary system. Since we humans have ten fingers, it only seems natural that we work in a decimal (or base 10) number system. For reasons we'll see later, computers work in base 2—hence binary. The way numbers work is independent of the base of the numbers. In decimal, the number *187* can be represented as follows:

```
100   10   1
 *    *    *
 1    8    7    ← DECIMAL NUMBER
-----------
100 + 80 + 7 = 187
```

Notice that we have 1s, 10s and 100s columns, and each is bigger than the previous one by a multiple of 10. Binary works the same, but with 2s. There are 1s, 2s, 4s and 8s columns, and so on, each column increasing by a power of 2. The number *187* in binary is written like this:

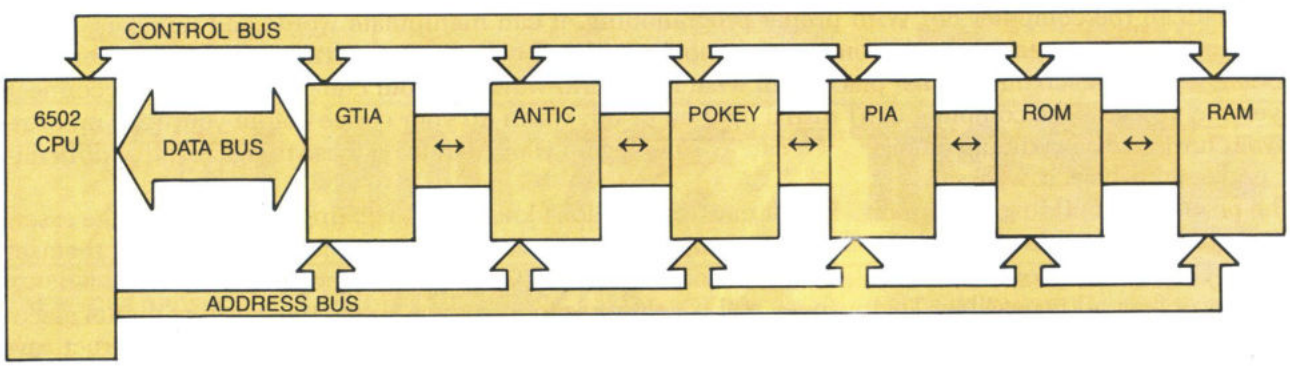
```
128  64  32  16  8  4  2  1
 *   *   *   *  *  *  *  *
 1   0   1   1  1  0  1  1   ← BINARY NUMBER
-----------------------------
128 + 0 + 32 + 16 + 8 + 0 + 2 + 1 = 187
```

The number *187* in binary is *10111011*. If you didn't understand this, then I refer you to **Boot Camp** in **ANALOG Computing**'s issue 13, September, 1983. In computerese, each column in a binary number is represented by 1 *bit* of information, either a *1* or a *0*. Eight bits form 1 *byte* and a half of a byte is (what else?) a *nibble*! Each byte can contain a number between 0 and 255. Try it yourself, 128 + 64 + 32 + 16 + 8 + 4 + 2 + 1 = 255.

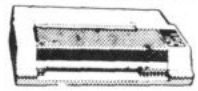
What's the biggest number that can be held by 16 bits?—*65535*. In computerese, this is *64*1024*, where each 1024 bytes is called 1K (*K* is the symbol for 1000 decimal). The Atari has 65536, or 64K individual memory locations, each holding 1 byte of information. By contrast, an IBM PC uses 20 address bits and can access 1,048,576 bytes.

Another word you need to know is *bus*. In human terms, a bus is a common carrier that runs to all parts of the city. In a computer, a bus is a set of wires that goes to all parts of the computer, sending or receiving common data needed by all the parts. There are three main busses: the address bus (which tells all parts of the computer which memory location the main processor wants to work with), the data bus (which carries the actual data to and from the processor) and the signal bus (which carries control signals).

Look at the block diagram of the Atari. Each of the sections has its own discrete numbered location between 0 and 65535. Each section, whether it is MEM-



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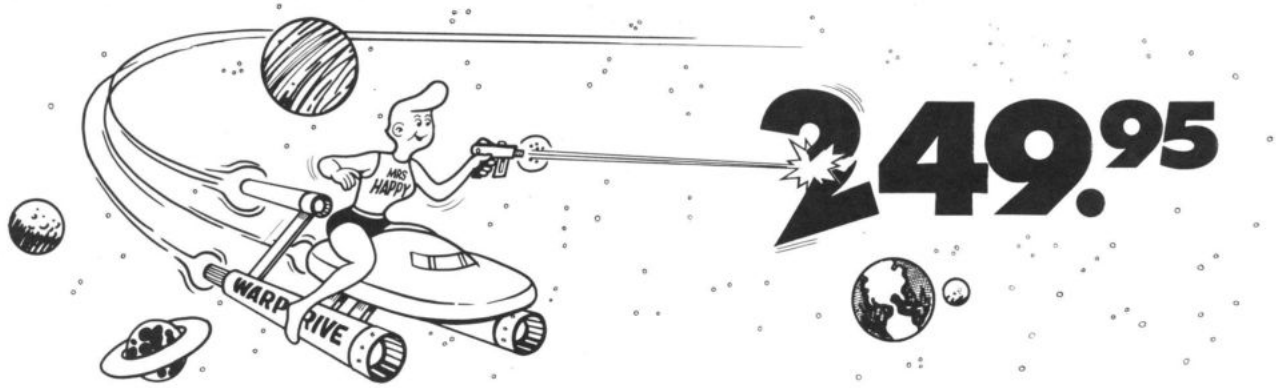
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CIRCLE #163 ON READER SERVICE CARD

ORY, PIA, ANTIC, POKEY or GTIA, constantly monitors the patterns of *1*s and *0*s on the address bus to see if it's the one being called. If it is, then the individual byte being called places itself on the *data bus* and looks to the signal bus, to see whether it is to send its contents or receive new contents. After it gets the signal, it does its job, then goes off the data bus and waits. In this way, the processor is giving and getting data constantly, 1.79 million times a second.

Figure 1 — Bus route.

This flow of data in Figure 1 is controlled by commands coded in machine language. For example, if you run the following program in BASIC, you'll install a machine language program at location 1536. You may have seen similar listings in other programs. When you run this machine language program via the USR function, the processor goes to location 1536 and executes the code there.

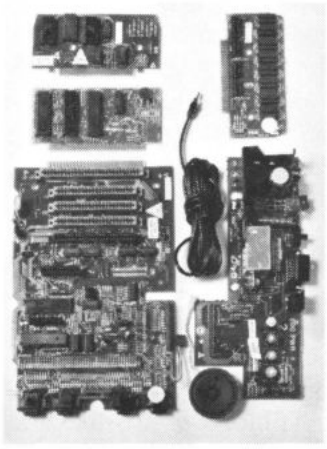
```
10 FOR S=1536 TO 1539:READ D:POKE S,D:
NEXT S
20 DATA 169,65,133,203
```

The first command is a 169. The processor turns on the address bus with the 16-bit binary number *0000011000000000* (1536). The memory device at location 1536 comes onto the data bus. The processor sends a read signal and the binary number *10101001* (169) is loaded onto the data bus by memory location 1536.

The processor receives this number and interprets it as a command to load a specific location within itself (called the A register) with the number at the next memory cell (LDA in assembly code). It places *0000011000000001* on the address bus and sends a read signal. Location 1537 comes on-line and sends *0100001* (65) up the data bus to the processor, where it's placed in the A register.

The next memory cell is read, and the command *10000101* (133 or STA in assembly) is read from location 1538. This command tells the processor to store the contents of the A register, but, before it can do this, it must read location 1539 to see where to store the contents of A, so *0000011000000011* goes

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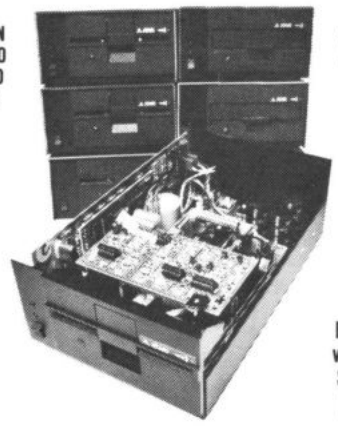
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down the address bus and 1539 responds by sending *11001011* (203 decimal) up the data bus.

Now the processor knows *what* it's supposed to do and *where*, so it puts out *0000000011001011* on the address bus (203 decimal). This time it puts the contents of the A register, *01000001* or 65 decimal, onto the data bus, then sends a write signal on the read/write control wire.

Memory location 203 comes alive and receives the number *65*, placing it into its 8 bits. Numbers are placed on the bus by putting either 0 or 5 volts onto each of the eight data wires that make up the data bus. Similarly, there are sixteen wires in the address bus.

Perhaps this seems deep, but it's the basis of mache programming. In BASIC, it would be:

```
10 A=65
20 POKE 203,A
```

On the microscopic level, this is how the computer functions. (I know I haven't explained how to control your toaster—but have patience.) Next month, we'll look at how computer logic works and how transistors function, and use the computer to sense outside events.

Onward and upward.

Now, to tweak your interest, let me outline the next few articles and what they'll cover. Number 2 will explain how computer logic and the joystick ports work, and get into alternate input devices. We'll see how to use pushbuttons to create a multi-player quiz game like those we see on TV.

Article 3 will explain how to reverse the joystick ports to control outside electrical devices, such as lamps and appliances. The fourth in the series is a construction article for a wireless home controller to regulate home electrical systems—lights, stereos, TVs and your coffee pot. In the fifth episode of this never-ending soap opera, we'll revisit the joystick input and build a high-speed optical sensor and a light pen, while explaining about the trigger lines.

I bet you never imagined there could be so much written about something so small, but we're not done yet! We can now apply what we know about input and output to build a simple and inexpensive real-time clock/calendar that will let your Atari report the correct date and time whenever you power up.

Finally, the last article on joysticks will cover how paddle inputs can be used for many kinds of sensors and level detectors. Included is a new kind of joystick, which can give instant cursor movement, useful for text editing and drawing programs.

Additionally, this column will cover how to use all the other peripheral connectors, including the serial port with the cassette recorder, and how to use the interrupt lines. We'll also cover the audio-video connector and show the proper way to build connector cables for amplifiers and monitors. Finally, there's the power plug on the XL/XE computers. Here, we can build a backup power supply to prevent memory loss in case of power failure. Sounds like a lot of fun to me! See you next month.

An Obstetrician-Gynecologist by day, Lee Brilliant, M.D. turns into a bug-eyed computer monster by night. He started on computers in August 1983 with TI 99/4A and rapidly graduated to Atari. He's programmed Apple, TI, Commodore and IBM, but prefers his old 800. His favorite pastime is tearing computers apart to see how they tick. Of course, he uses a scalpel!

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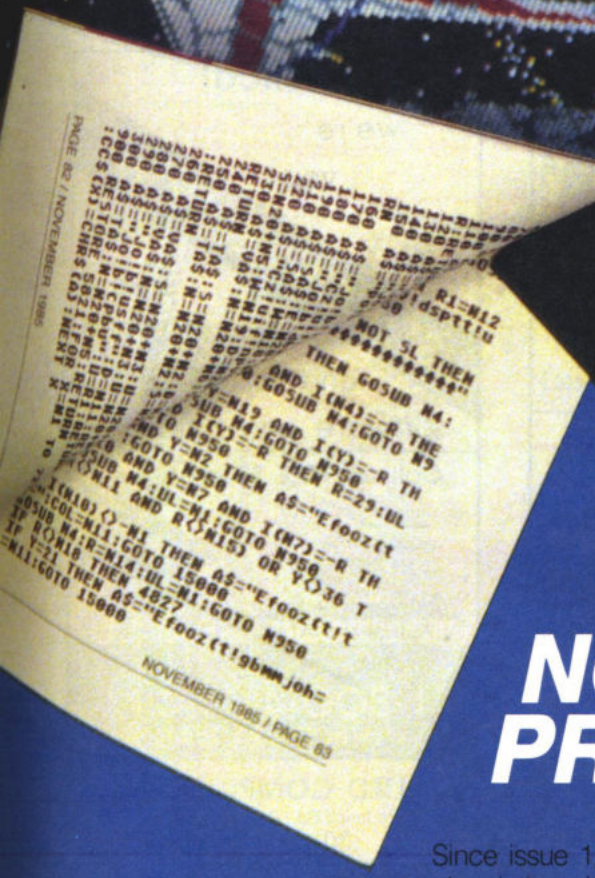
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