NO. 32
JULY 1985

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## FEATURES



**FEATURES *continued***



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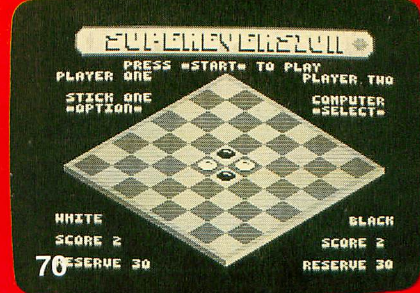
## COLUMNS





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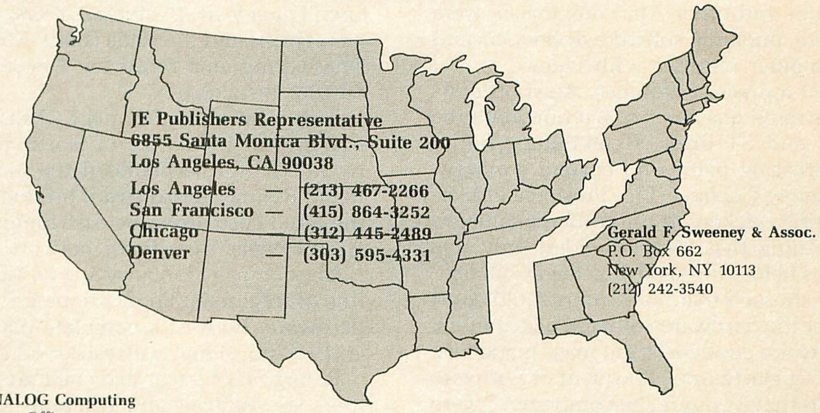


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# Atari at Comdex

by Jon A. Bell

Atari Corporation was in full force at Comdex, held May 6th-9th at the World Congress Center in Atlanta, Georgia. Jack Tramiel, James Copland, Sig Hartmann and other Atari employees were there, pursuing software developers and computer retailers with vigor.

At a press conference, Atari officials answered questions concerning both the XE and ST lines of computers, future marketing plans and current strategy.

James Copland, Vice President of Marketing, kicked off the conference by explaining that "Atari decided only five days before the show to attend Comdex." He stressed that, here, Atari could court specific hardware/software distributors, software developers and mass marketers.

Sig Hartmann, President of Software said that "around 230 companies" were developing software for the 8-bit XE and the 16-bit ST computers. When quizzed about software for the ST, Hartmann replied that he expects "over 100 pieces of software" to be available for STs by September. ST development systems for software companies are being shipped at list price, a substantial reduction from the original ST package price of around $5000.

Per earlier announcements, the first STs will be shipped to user groups for beta testing in a week or two. BASIC and Logo will be included, though there are conflicting reports as to whether GEM will be on ROM or disk. The first STs for the public are to be shipped in July.

Among software being developed for XEs and STs are spreadsheets and other applications programs from varied manufacturers. VIP Technologies, of Goleta, California has developed a package for the XE—**VIP Professional**. According to VIP, the **Professional** combines all the features of Lotus 1-2-3 with some additional features, all for under $100. It can be mouse or keyboard driven, and utilizes icons and "drop down" menus, like the ST's GEM. The program is slated for delivery in July.

For the ST, Haba Systems of Van Nuys, California offers two programs: **Haba Works**, with a series of applications—WORD, FILE, CALC, GRAPH, COM and HIPPO C COMPILER. **Haba Solutions** comes with such files as How to Start Your Own Business, How to Create Your Own Legal Will, Business Letters, Business Forms and the Haba Check Minder. These programs retail for $59.95 and $49.95, respectively.

In a joint announcement, Atari and Rising Star Industries of North Hollywood, California heralded the marketing of Rising Star software products for the ST. These are to be distributed via Atari's dealer/distributor network.

The company is converting its Valdocs line of integrated applications for Atari hardware, both as a complete package and in individual software modules.

Rising Star's integrated color graphics modules, **Valdraw** and **Valpaint**—using Atari's high-resolution color display—are marked for availability with early shipments of the computer. The company's electronic spreadsheet and other applications are scheduled to follow shortly thereafter.

In hardware news, one of the most amazing announcements centered on Atari's marketing plans for the 520ST. Apparently, there will be two different versions of the ST: one for mass marketers and one for computer stores.

Internally, the machines will be identical—only the machine's cosmetics are to be altered. The mass marketed ST would be in the original configuration, whereas the computer dealers' version will have a different keyboard and case. Computer retailers will sell as a package the modified ST, the monitor and the half-megabyte drive for $799.

As far as future projects go, Atari is working on a CD (compact disk) ROM, capable of storing over 5 megabytes of memory, for under $500. The CD ROM and a new 3½-inch drive are being developed with North American Philips, the Netherlands-based electronics giant.

The subject of Atari's 32-bit computer was not ignored by the press. Atari's rumored CAD/CAM system was referred to as a "graphics workstation" by Jack Tramiel, who said the machine should be out "late this year or. . .early 1986."

Atari officials stated that the 32-bit machine might run UNIX, with a secondary operating system available. The 32-bit machine will be sold only through computer stores.

Last March, Leonard Tramiel told **ANALOG Computing** that Atari's engineers wanted to get several prototypes of the 32-bit computer working specifically on developing chip designs for Atari equipment, including the STs. But the engineers couldn't sacrifice ST time to work on the 32-bit computer. Instead, they used an extensive amount of chip development and design equipment from the old Atari.

And, finally, Atari's decision not to have a display at the Consumer Electronics Show in June had been met with negative publicity and rumors about the company's financial state. Jack Tramiel emphasized that Atari didn't bow out of CES "simply to save $500,000," but that Atari would be represented by a private press conference in Chicago.

It should be pointed out that a number of hardware and software companies (Infocom, Electronic Arts) are also not attending the show, but are, instead, having private press showings and parties to promote their products.

Additionally, Atari officials "lack of comment" over the decision not to have a display at CES was due to said officials' attending the Hanover, West Germany Computer Fair.

According to sources at the fair, the showing of Atari's ST computers was "a smash." Overseas dealers and computer owners are reportedly ecstatic over the ST, citing its power, the GEM operating system and, most important, its cost.

Foreign buyers who can't afford the Macintosh are considering the Atari ST. Jack Tramiel said that he intends for fully half of all ST sales to be overseas.

In conclusion, the message from Atari at Comdex was, "Today, the U.S. Tomorrow, the world!" □

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# READER COMMENT

**What was the code, and where are the free books?**

This letter is in three parts:

1. You announced a contest in the January 1985 issue (26) on page 90. I spent many frustrating hours on trying to find the key to the code, but without success. Would you please publish the answer to the code-cracker contest?

2. Have you ever considered publishing an end-of-year index to your magazine? Many technical publications do, and it certainly aids the owners in referencing feature articles, reviews, etc. I started reading **ANALOG Computing** with issue 8 and many times referred to articles in old issues, but have some difficulty finding them.

3. In your February 1985 (issue 27) editorial, you mentioned an incentive for renewing membership. The promotion was for two free books, and you said, "If you subscribe for two or more years, you'll receive both books." I sent my check on January 6th. I did receive the *ABCs of Atari Computers*, **but not the** *Atari Roots* book. Could you please see that I get the second book?

I am a computer programmer. After a hard day at the office, I take a break with my Atari and your magazines. Keep up the good work.

Yours truly,
Robert G. Andersen
Glen Burnie, MD

*1. The answer to the code cracker contest is "Behind every good programmer there stands an Atari computer. Congratulations!" Don't feel too bad; no one figured it out.*

*2. We provided an index to articles in issue 15. Yes, we are considering doing another, updated version at the end of this year.*

*3. Our stock of* Atari Roots *is now depleted. We received over 1000 subscriber requests per week, and the offer was on a "while they last" basis. We have another book,* Atari Color Graphics *to replace* Atari Roots. *However, our offer for the free books is no longer in effect.*

---

**800XL and 600XL BASIC fix.**

Most people aren't aware that 600XL and 800XL computers made to date have a *defective BASIC*. The problem is that, every time you SAVE a program, BASIC appends 16 useless bytes to the file, and this is cumulative. If you LOAD and SAVE a file a second time, another 16 bytes is added. Try this:

```
PRINT PEEK(43234)
```

If the result is a 96, you have the defective BASIC. Should it return a 234, you have the updated Revision C. This is only out in cartridge form; insiders at Atari say it's too expensive to change the XL assembly line to REV.C BASIC.

This bug is serious. Many people run into ERROR 9, string not dimensioned, at the very program line where the DIM occurs. It's the result of the extra bytes. With large BASIC programs (16K or more), many more problems can crop up. The worst is computer lockup when editing a program in memory, or just by LOADing a file that has been "saved one time too many." How many? I can't tell you, but you'll know—when it happens.

Here's a simple program that demonstrates the bug:

```
10 PRINT FRE(0):SAVE "D:JU
NK":RUN "D:JUNK"
```

Do this on a disk that doesn't have any important files. If you run this long enough, you'll get an out of memory error or a "scrambled" disk.

Atari made a REV.C cartridge available some time ago, for $15. Since that time, they started giving REV.C to new XL owners, free of charge. Unfortunately, it usually took several letters and irate phone calls to get anything done about it. My source tells me that Atari is out of REV.C cartridges at this time, and they don't have enough requests to justify another production run. They claim that not enough people are calling to complain about it. If that's true, I'd like to know why Atari stopped answering their customer service line. If you *do* call, you'll only hear a recording, telling you to take your computer back to the store for an in-warranty return.

This is ludicrous. The poor consumer, who bought a computer to learn BASIC, is at the mercy of Atari's defective REV.B BASIC! A beginner will be inclined to believe the ERROR is because of something he did wrong, not the computer itself.

I've been programming Ataris for 4½ years now, and it took me 2 weeks of intensive studying to uncover the defective BASIC. The new ROM is available; I have the REV.C cartridge. It can be plugged into the computer in place of the REV.B ROM. This isn't advised for the average user—I'm an Electrical Engineer, with 5 years' experience in computer repair.

I urge all XL owners to write about this problem. Give your name, address, phone number and the serial number of your 600 or 800XL. The address is: Atari Customer Relations, 1312 Crossman Ave., Sunnyvale, CA 94088.

Matthew J.W. Ratcliff
Ferguson, MO

---

**AUTORUN.SYS aid.**

I believe I can help Troy Goodson (**Reader Comment**, issue 29, "Problem Solvers").

On page 17 of the DOS III manual, there's a list of the files present on the master disk. One of these, HANDLERS. SYS, looks for and runs any AUTORUN. SYS files present on that disk. It will also boot up the 850 interface if it is present and already switched on.

Troy's problems should be over if he uses the COPY/APPEND function from the DOS III menu in transferring HANDLERS.SYS from the master disk to his disk, with the FMS and the AUTORUN file.

Just as a matter of interest, booting from a disk with FMS.SYS present allows one to LOAD and SAVE in the normal way, but going to DOS results in entering memo pad mode (400/800).

SYSTEM RESET recovers, by the way. You need, at the minimum, to have copied KCP.SYS to this disk and to have inserted the master disk if you wish to use DOS.

These two files, and HANDLERS.SYS, roughly equate to the DOS.SYS file on a DOS 2 disk.

To reiterate. . .To run an AUTORUN.SYS file under DOS III, FMS.SYS and HANDLERS.SYS need to be present on that disk, also.

Many thanks for an interesting and worthwhile magazine, well worth every penny. Long may you continue.

Yours faithfully,
Derryck Croker
Sudbury, U.K.

---

**More on Cheep Talk.**

I enjoyed the **Cheep Talk** article in issue 29 of your fine magazine. Having completed this project myself, I would like to offer some help to any other do-it-yourselfers. These ideas will both assist in obtaining parts and making assembly quicker and easier.

The 22 pf. capacitors required for the project aren't available from Radio Shack (or many other electronics suppliers). Two 47 pf. capacitors (Radio Shack part #272-121) used in series are an almost exact substitute and are readily available.

The joystick connectors for this project can be made more simply (and more cheaply) by using two joystick extension cords (Radio Shack part #276-1978). The cords are already assembled and do not require modification of the plugs in order to fit the computer. The conductor color coding for the pins is as follows: Pin 1 - Green; Pin 2 - Yellow; Pin 3 - Orange; Pin 4 - Red; Pin 5 - Brown; Pin 6 - Blue; Pin 7 - Black; Pin 8 - Gray; Pin 9 - White.

If these joystick extension cords are used, I recommend that a strain relief (Radio Shack part #278-1636) be used with each cord.

I hope other **ANALOG Computing** readers will enjoy this project as much as I have. Keep up the good work, **ANALOG**. You are the best magazine around for the Atari owner.

Sincerely,
Anthony A. Nogas
Plymouth, MA

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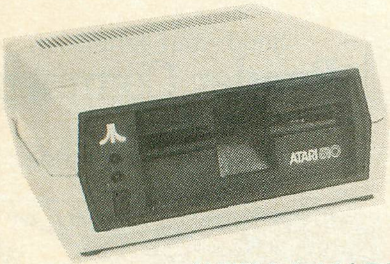


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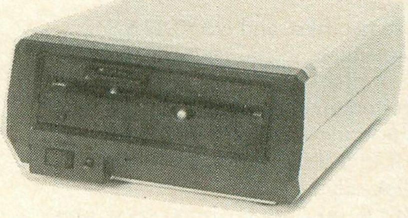

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The **101**'s cost is $399.95. For information, contact Alphacom, Inc., 2323 S. Bascom Ave., Campbell, CA 95008 — (408) 559-8000.

### ATARI XL USER'S HANDBOOK

This new book covers beginning concepts for the new user, explaining Atari BASIC, graphics, DOS and file handling.


The sections include peripheral and add-on devices, software, computer installation, programming concepts, using a printer, and PEEK and POKE locations.

Written by the Weber Systems, Inc. staff, 360 pages, the handbook sells for $15.95. From Weber Systems, Inc., 8437 Mayfield Road, Chesterland, OH 44026 — (216) 729-2858.

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Two sturdy, slick plastic reference cards are available for Atari computers, both from Handi Publishing. The **Handicard** for the **AtariWriter** details page layout commands, editing commands and printing commands. Also covered are Epson printer control codes.


A second card, for new Atari BASIC users, covers computer operations, programming and data commands, graphics and sound, math and string commands, and an error code listing. These cards fit above the top row of keys and stand upright.

Priced at $8.95 each from Handi Publishing, P.O. Box 453, Ardsley, NY 10502.

## OTHER NEWS

Three new programs from Activision will soon be shipping—**Alcazar: The Forgotten Fortress**, **The Great American Cross-Country Road Race** and **Countdown to Shutdown**.

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■ ■ ■

Strategic Simulations announces the release of **Computer Quarterback**. Features include real-time play, semi-automated graphic display of offensive and defensive alignments, and one- or two-player modes.

Their other new titles include **Computer Ambush**, a World War II strategy game, and **Knights of the Desert**, a recreation of that war's North African campaign.

Cost is $39.95 each, except **Computer Ambush** is $59.95. Strategic Simulations, 883 Stierlin Road, Bldg. A-200, Mountain View, CA 94043 — (415) 964-1353.

■ ■ ■

Kylan Software has introduced their **Pascal** compiler for XL/XE computers (64K is required).

Features touted are a 6502 machine code compiler, enhanced sound and graphics, a built-in assembler and complete tutorial manual. DOS 2.5 is shipped with **Pascal**.

Priced at $69.95 from Kylan Software, 1850 Union Street #183, San Francisco, CA 94123 — (415) 775-2923.

■ ■ ■

Spinnaker Software's **Math Busters** "presents an unusual and vivid environment" that combines math practice, music and dancing to help children overcome their math fears.

Written by Tom Snyder Productions (**Agent USA** and **Snooper Troups**), this program increases in difficulty as you become more successful.

For information, contact Spinnaker Software, 215 First Street, Cambridge, MA 02142 — (617) 868-4700.

# The Latest Innovations From CDY At The Lowest Prices Ever!

## Crisp, perfectly legible 80 columns!

OMNIVIEW is a means of achieving professional word processing on your Atari! At one time you needed an expensive, slot consuming board to achieve 80 columns and it was only available for the 800. But now even you 400, 600XL and 800XL owners can enjoy the power and convenience of 80 columns at a very modest price! You see, OMNIVIEW takes advantage of the high resolution graphics mode already built into the ATARI to generate an 80 column screen editor essentially identical to the ATARI screen editor (E: S: ). This means that OMNIVIEW will give you an 80 column output in most environments where the 40 column E: would be used (BASIC, MAC 65, modem programs, etc.). In addition, OMNIVIEW will work with the 80 column versions of Letter Perfect and Data Perfect, probably the most popular combination of professional quality word processor and data base for the ATARI. Designed to be legible even on a TV set for casual use, OMNIVIEW's character set looks super on a monochrome monitor or color monitor with separate chrominance and luminance inputs.

But there are other features built into OMNIVIEW to make it even more attractive. The 400/800 version has built in AXLON Ramdisk handlers to allow you an ultra fast disk drive with almost any DOS which uses standard SIO calls (2.OS, MYDOS, DOS-XL,etc.) The 600XL/800XL version (OMNIVIEWXL) has other outstanding features which alone are worth the price! How many of you XL owners have cursed the translator disk from the day you bought your computer? OMNIVIEWXL has an enhanced operating system which is extremely compatible with the old 400/800 OSB, allowing it to run most of those programs which would not ordinarily run on an XL without the translator disk! A new feature of OMNIVIEW is that it will allow you to copy the operating system into RAM, freeing up the 4K of extra user RAM and allowing even those nasty games which look for ROM in the $C000 page to run! And you ATR8000 owners will love the built in 80 column ATRMON,allowing you to instantly switch back and forth between the ATARI and CPM environments. Lastly, OMNIVIEWXL includes the famous FASTCHIP floating point package for significantly increasing the speed of programs like BASIC which use floating point. With all of these features at such a modest price, don't delay. You can start enjoying the wonderful convenience of OMNIVIEW within a couple of days of placing your order!

### Feature Comparision Chart

| | OMNIMON Piggy-back 400/800 | Ramrod OS Board 800 | ——Upgrades for—— ——OMNIMON or Ramrod—— 8K OMNI | 8K VIEW | 4K VIEW | Ramrod-XL Piggy-back 800XL | Addon for Ramrod-XL VIEWXL |
|---|---|---|---|---|---|---|---|
| Enhanced OS w/Fast Cursor | | + | | | | + | + |
| Includes FASTCHIP FP | | | | | | + | + |
| 80 Columns Emulation | | | | + | + | | + |
| AXLON Ramdisk Handlers | | | + | + | + | | |
| OMNIMON Features: | | | | | | | |
| A:Alter Memory | + | + | + | + | | + | |
| B:Boot (Ram) disk | | | + | + | + | | |
| C:CPU Registers | + | + | + | + | | + | |
| D:Display Memory | + | + | + | + | | + | |
| E:Single Step Execution | + | + | + | + | | + | |
| F:Fill Program Buffer | | | + | | | + | |
| G:Binary Load / Directory | | | + | | | + | |
| H:Hex Conversion | | | + | + | | + | |
| H:Hex Arithmetic | | | + | | | + | |
| I:Install Ramdisk Handlers | | | + | + | + | | |
| J:Jump Subroutine (JSR) | + | + | + | + | | + | |
| L:Drive Selection/Control | + | + | + | + | | + | |
| M:Move Block of Memory | | | + | | | + | |
| N:Relocate 6502 Code | | | + | | | + | |
| O:Operate from Program Buffer | | | + | | | + | |
| P:Printer Control | + | + | + | + | | + | |
| R:Read Sector(s) from Disk | + | + | + | + | | + | |
| S:Search Memory for Sequence | + | + | + | + | | + | |
| T:Toggle Hex Char Display Mode | + | + | + | + | | + | |
| U:User's Custom Command | | | + | | | | |
| V:Verify 2 Blocks of Memory | | | + | + | | + | |
| W:Write Sector(s) to Disk | + | + | + | + | | + | |
| X:Disassemble Memory | + | + | + | + | | + | |
| Y:Line Assembler | | | + | | | + | |
| Z:Exit Monitor | | | + | | | | |
| Lockup Recovery | | | + | + | | + | |
| Redirection of Printer I/O | | | + | + | | + | |
| Talk to Happy Ram Buffer | | | + | + | | + | |
| 80 Column ATRMON for ATR8000 | | | | | | | + |

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## Incredibly powerful debugging monitor!

OMNIMON is a ROM resident extension of the ATARI operating system which adds a new dimension to your machine! In the hands of a novice programmer it is a wonderful learning tool for discovering the many secrets of your ATARI. And the more you learn, the more OMNIMON has to offer, so that experts find it indispensible for its power and convenience. It installs permanently and gives you complete control over your computer, and even though it is always available (by pressing SELECT and SYSTEM RESET), it takes up no user memory because it resides in the unused 4K block at $C000. Use it to interrupt, examine, and manipulate any program in memory whether it be disk, cassette, or cartridge based. It is especially good for program development or customization of existing programs. The flexible disk I/O allows you to write to or read from disk in either single or double density so that you can edit raw sector data or even load a file without DOS. Many debugging tools are at your disposal: Display/Alter memory or 6502 registers, Disassemble memory, Search memory, Hex/Char modes, Single Step execution, JSR or GOTO address, Push/Pull stack, Printer dump, etc. A toggle switch allows you to make OMNIMON invisible to games which might be looking for it, making it compatible with all software.

If all of this power weren't enough, certain versions of OMNIMON have even more features! The 8K OMNIMON and OMNIMONXL have Hex Conversion and Hex Arithmetic, Block Move, a Relocator, and a Line Assembler. A Binary Load command allows you to load any binary load file without DOS and doubles as a disk directory command which prints out the start sector of each file. Lockup recovery allows you to recover from system lockup, meaning that when your computer freezes, you can usually salvage the program or text file in memory by popping into OMNIMON and dumping memory to disk. Advanced users will like the user extendibility feature which allows them to make use of the interface routines of 8K OMNIMON in their own software. The 8K OMNIMON also has resident AXLON Ramdisk handlers, allowing you to use this powerful device as an ultra fast disk drive with almost any DOS which uses standard SIO calls and even boot programs like word processors, data bases, and games which access the disk a lot. Once you have an OMNIMON in your system, you will wonder how you ever did without it!

### Pricing

400/800: Piggyback board plugs into existing OS board. Inexpensive and easily disabled.

| | |
|---|---|
| OMNIMON piggyback board | $69.95 |
| OMNIMON piggyboard & OMNIVIEW | $94.95 |
| OMNIMON piggyback board & 8K OMNIVIEW | $109.95 |
| OMNIMON piggyback board & 8K OMNIMON | $109.95 |
| Add FASTCHIP floating point to any of the above | $15.00 |
| FASTCHIP floating point package by itself | $19.95 |
| OMNIVIEW for piggyback or Ramrod OS board | $29.95 |
| 8K OMNIVIEW or 8K OMNIMON for piggyback or Ramrod | $44.95 |

800: Ramrod OS board replaces existing OS board and comes with enhanced OS in EPROMs. It has 2 sockets for OMNIMON/OMNIVIEW enhancements which can be selected with a switch.

| | |
|---|---|
| Ramrod OS & OMNIVIEW | $124.95 |
| Ramrod OS & 8K OMNIVIEW | $139.95 |
| Ramrod OS & 8K OMNIMON | $139.95 |
| Ramrod OS & 8K OMNIMON & OMNIVIEW | $164.95 |
| Add FASTCHIP floating point to any of the above | $15.00 |

600XL: The supplied ROM replaces existing OS chip on mother board.

| | |
|---|---|
| OMNIVIEWXL (includes FASTCHIP and 800 compatible OS) | $59.95 |

800XL: Replace existing OS chip or add Ramrod XL to select between 3 possible OS's.

| | |
|---|---|
| OMNIVIEW (includes FASTCHIP and 800 compatible OS) | $59.95 |
| Ramrod XL & OMNIMONXL (includes FASTCHIP and 800 compatible OS) | $99.95 |
| Ramrod XL & OMNIMONXL & OMNIVIEWXL (i.e., combination of all above) | $144.95 |

**Other fine products:**

| | |
|---|---|
| **LJK Letter Perfect or Data Perfect** | **$69.95** |
| **OSS BASIC XL, MAC 65 or ACTION** | **$69.95** |
| **OSS BASIC XL, MAC 65 or ACTION tool kit** | **$34.95** |
| **Monochrome monitor adaptor for 400 (perfect for OMNIVIEW)** | **$29.95** |
| **AXLON Rampower 128 (Ramdisk)** | **$249.95** |

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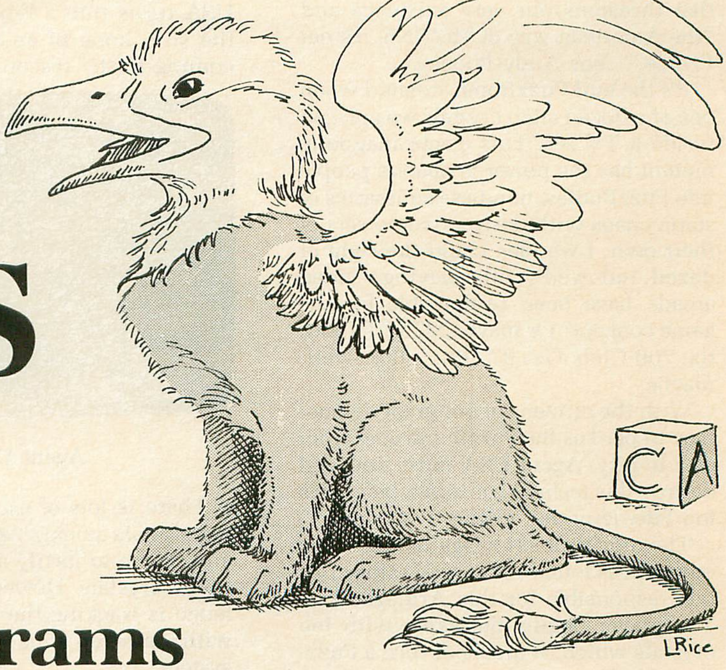


## Educational Programs Review

by Braden E. Griffin, M.D.

All right, class, sit up straight and pay attention. We're going to discuss geography. *Ugh! Bor-ing.* But yes, geography. It *is* important, you know. But, first, a few anecdotes to underscore the depth of knowledge currently maintained by the majority of our citizenry.

I hail from West Virginia. I realize that this is less than a big deal, but that's the fact, Jack. Mentioning this usually elicits a remark about shoes, then a "Gee, I know somebody from Richmond." Richmond? *Richmond?!* For Jerry West's sake (a common Mountaineer epithet), that's in *Virginia*.

During my years in Colorado and Arizona, the discussions of my origins, referred to as "Back East," would often give rise to remarks like "I have an uncle in Michigan." Michigan? Sure, I know him. We're practically neighbors.

Bostonians give new meaning to the word *provincial*. (They also give new meaning to the word *basketball*.) There is a story told of a very proper Boston Brahmin matron, who, upon learning that a guest at her dinner party was from Ohio, replied, "Heahh, we pronounce it *Iowa*."

Had enough? No? How many people know the capital of New Mexico? Not to worry, if you can't spell *Albuquerque*, 'cause that ain't it. How about Oregon? It has to be Portland. . .or, maybe, Eugene? Yes, Charleston is a state capital, but it's a fer (sic) reach to Myrtle Beach. You may remember that Pierre is a capital city, but of which Dakota, East or West?

It would be your fault if you bought beachfront property in Nevada, unless another fault preempts. A six-pack of Molson's for all you Americans who can name the Capital of Canada without looking. You know Canada—that large country just north of us. Of all the inhabitants of the Americas, we have the gall to assume the unique title, "Americans." We go beyond arrogance. I think the word is *hubris*.

Get the point? I don't think it unreasonable for someone to know what states one would pass through to go from Texas to North Dakota, or Detroit to Miami. Someday, one may need to know just where Cleveland is. . . if only to avoid it. Just kidding. How 'bout them Cavs?

The program reviewed this month provides an entertaining way to explore the continental U.S. while enhancing many other learning skills.

**AGENT USA**
**Tom Snyder Productions, Inc.**
**SCHOLASTIC WIZWARE**
**906 Sylvan Avenue**
**P.O. Box 2010**
**Englewood Cliffs, NJ 07632**
**48K Disk $29.95**

Readers familiar with Tom Snyder's contributions to the field of educational software, which entertain and enlighten children, will not be disappointed by this clever, creative package for children ages nine and up. This game encourages the development of an organized approach to a problem, using a combination of factual information and logical thinking.

The excitement of the game itself provides more than enough initiative to get kids started playing, while the challenge and, occasionally, the frustration will hold their attention.

**Agent USA** is the good guy. And just guess who gets to be this super sleuth from the Central Intelligence Bureau? Right again, 007. What is the menace that threatens our very existence and "the American way of life?" No, it's not Prince. . . nor Andy Rooney.

It's the evil FuzzBomb, created when one of a dozen alien crystals was placed inside a TV set. This electromagnetic mutant has the power to change people into FuzzBodies, mindless emissaries of static chaos with destructive powers of their own. I wonder, could the sight of dazed, red-eyed youths leaving a video arcade have been responsible for the game concept? Or maybe MTV? I know, the 700 Club. Get it? 700. . .007. Well, maybe.

With the citizens of our great democracy in peril as the FuzzBomb goes from city to city, **Agent USA** must find and destroy this technologic terror, before it's too late. (Another cliche. . .a relapse?)

The only protection against the Fuzz creatures is found in the very same crystals responsible for this Armageddon. The player begins the game with ten crystals which, if touched, turn a FuzzBody back into a normal person.

Extra crystals can be grown by planting them and waiting for them to multiply. It is not only necessary to have an ample supply of crystals to rescue the "fuzzed," but the maximum supply of one hundred crystals is required to disarm the FuzzBomb.


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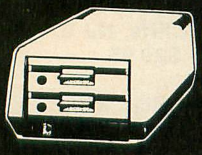

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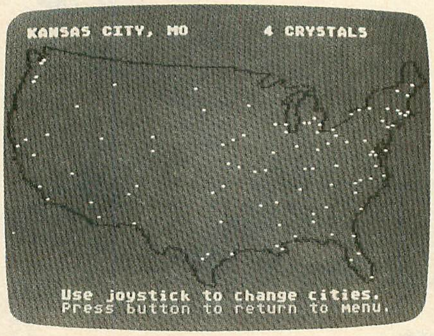
If touched by a FuzzBody, one-half of the crystal supply is taken away. If the supply is totally depleted, whether by the FuzzBomb or its henchmen, **Agent USA** turns into a FuzzBody, and only the slim hope of an unfuzzed citizen coming to the rescue remains.




**Agent USA.**

There is lots of excitement in growing crystals quickly, zapping FuzzBodies and trying to fortify a town with additional crystals. However, the real challenge is tracking the FuzzBomb down with gathered clues and the railway system.

InfoBooths are found only in state capitals and Washington, DC. Here, a computer terminal that's linked with CIB headquarters provides information relating to the number of crystals fortifying a particular city, the FuzzBomb's exact location, and a prediction map, which shows "fuzzed over" cities and the likely direction of the spread.

The train travels to all the state capitals and many other major U.S. cities. Tickets are obtained at a ticket booth (did you think it would be the bakery?), where a train schedule appears on the screen. After one has selected and typed in a destination, a ticket for that train is issued.

A continuous display of the time is always on the screen. Trains arrive at the station every few minutes. When the right one comes along at the right time, it is boarded. Once the time required for that particular trip has elapsed, thanks to a speeded up computer clock, one detrains at the depot (doffing one's derby to Darling Dora with the dazzling diamond D dangling from her dainty, dimpled neck). Care must be taken at the train stations, since FuzzBodies may be using this mode of transportation, and bumping into them is worse than being without Certs.

Now, it might seem pretty simple to go to an InfoBooth, find out where the FuzzBomb is, then get a ticket to that city and waste the sucker. Not so. Wherever one happens to start from, the city is connected by train only to those cities surrounding it.

There is no train directly from Mobile to Denver. And, although there are a few "rocket trains," which travel long distances very quickly, most of one's travel will be by the local, slower trains. A knowledge of a city's location within a state is necessary for efficient travel. If one wants to go to Wilmington, Delaware from Syracuse, New York, it's important to know if the train to Buffalo, Albany or Rochester is most appropriate.

Sounds kind of like real travel. **Agent USA** just arrived in Ohio and wants to know where the FuzzBomb is. Let's see. InfoBooths are located in state capitals. Ohio. . .hmmm. Toledo? Akron? Cincinnati? Hello, Columbus!

Success with **Agent USA** requires the player to organize activities as they relate to train schedules and the logistics of ongoing events. While accomplishing the task of travel, one must prepare and plan for confrontations with the enemy, by growing crystals and fortifying cities. These are important skills to develop, and **Agent USA** does it under cover of fun and excitement.

This extremely well-designed and accurate game package includes an Information File and U.S. map, that shows major cities and state capitals on the train route. The ability to trace train routes on the map, then wipe it clean adds a nice touch.

Those becoming expert in **Agent USA** should consider a career with the Center for Disease Control (CDC) in Atlanta. I bet epidemiologists have nightmares like this game. *That's* where the idea came from. . . a virulent, extraterrestrial organism capable of turning men and women alike into indistinguishable miscreants. . .*The Androgynous Strain.* □

*Dr. Griffin, as Chief of Newborn Medicine at a perinatal center, spends most of his time in the newborn intensive care ward. Off-hours, he's been using an Atari 800 for four years.* ***ANALOG Computing*** *magazine is almost entirely subsidized by Dr. Griffin's health insurance reimbursement, for providing psychotherapy through writing—to cure his unbelievable attraction to cliches.*

**MAGNIPRINT II**
**ALPHA SYSTEMS**
**4435 Maplepark Road**
**Stow, OH 44224**
**(216) 374-7469**
**48K $24.95**

**by Frederick D. Oldfield**

**Magniprint II** is one of the programs responsible for the dreaded love-hate relationship all too familiar to computerists.

I really *wanted* to love this program. After all, it promised to provide a printout of all my graphic masterpieces. It does. Whether you use **Micro-Painter**, **Micro-Illustrator**, **Paint**, **Fun With Art**, **B/Graph**, **Graphic Master**, **Strip Poker**, **Super Sketch**, **Movie Maker**, **Graphics Magician** or the **Atari Light Pen**, this program allows you to make printouts.

In fact, you can even make prints of screens created with your own or magazine programs, such as **Magic Palette** from **ANALOG Computing**'s issue 26. There's a special screen save routine to add to these programs. The file thus saved can then be used by **M-II**.

A similar process is performed on some or all of the commercial programs. Their picture files are converted to a kind usable by **M-II**. Therein lies the first problem: in order to print a screen, **M-II** must be able to access and use files in which screen data is stored.

One of my favorite graphics programs, **The Alog Displaymaker**, isn't included in the list of covered programs and, as it's written in FORTH, I can't add the BASIC routine to save compatible files. **Displaymaker** does have its own printer dump routines, but they're not as versatile as **M-II's**.

With **M-II**, you can get a quick printout in normal or inverse print. This is a sideways print approximately 1/4 page in size. You can also print in normal or sideways formats in up to eight different sizes, or you may choose three different poster sizes. Posters are printed in sections and must be glued or taped together.

Another great feature is the ability to add text to most screen files. The problem: text position must be indicated with the joystick, and there are no controls for centering or undoing a letter— except to erase it by deletion, which also deletes whatever was on the underlying design. While you may use inverse and even graphics characters, you can only print in one size.


**Magniprint II.**

There's a "touch-up" feature, but I found it difficult to use and was unable to match the background shade I was trying to replace.

**M-II** has a feature to let you view your screen in a different graphics format. A graphics 9 screen can be viewed or even printed as a graphics 8, and vice versa. Even a graphics 10 screen can be viewed and/or printed in graphics 9 or 8. (The text adding feature is only available in graphics 8, so these conversions come in handy.) In fact, **M-II** is supposed to be able to provide a printer dump for all Atari graphics modes except text modes 1 and 2. Even normal graphics 0 can be dumped. I haven't tried any graphics modes other than 7.5, 8, 9, and 10.

So why does this program also rouse in me feelings of hatred? **M-II** comes with a simple but seemingly complete manual of twenty or so pages. The manual gives you the feeling that you'll have no problems making the program work. Unfortunately, it isn't quite true.

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CIRCLE #106 ON READER SERVICE CARD


## Review
*continued*

First, for all of the slow, detailed printing, the **M-II** program disk *must* be in drive 1. I don't remember reading that anywhere, and there's no prompt on screen. If you make an error and don't have the right disk in the drive, you may or may not lose the screen you're working on. In any case, you're usually given no clue of what the problem is.

Error trapping is reasonably good, but imperfect. Another annoyance is the cursor used in the program. It's extremely small and often difficult to see.

Switching graphics modes is accomplished by pressing the ESCape key. Other than the difference in screens, there's no indication of what graphics mode you are in. This is probably not a serious problem—it's more of a psychological problem. It makes me feel less confident about what I'm trying to do.

Maybe that's my real gripe with **M-II**. Its power is obvious, its features many, but I feel somewhat overwhelmed. This isn't a program you'll master in a day or two. Sure, you can use it almost immediately, but it will take time and practice to exploit its full potential.

Along with the main program, you also get **Print All**, which will allow you to print your BASIC listings with all inverse and graphics characters.

The manual does include some troubleshooting information and a reference sheet of available options. The disk is copy-protected but, in addition to a 90-day warranty period on the media, Alpha Systems will replace a defective disk for $6.50. Not as convenient as being able to make your own back-ups (and with the heavy use the disk gets in printing, this would have been a good idea), but at least the replacement isn't too expensive.

If you're prepared to experiment and take the time to master the program, **Magniprint II** is a versatile and powerful program which will meet most, if not all your printout needs. At $20.95, the price is hard to beat. □

*Fred Oldfield, an instructor in the retraining department of Mohawk College, purchased his first Atari in 1981. It has become a workhorse, producing newsletters, mailing lists, course materials, class records and articles.*

# Access III

## DOS III to DOS 2 Converter

by Matthew Jones

Until recently, I was working for Atari International in the U.K. as a Product Support Specialist. You undoubtedly know that product support was one of the departments to go in the Tramiel takeover.

A week before it happened, I was asked by a disk user how to transfer DOS III files to DOS 2. DOS III comes complete with a program to enable users to access DOS 2 programs, but not vice versa. So, with time on my hands, I've written a program for this purpose, which I call **Access III**.

The listings and disk files for **Access III** will transfer *any* DOS III file to DOS 2 (accepting limitations of single-density disk space), making more than one pass if necessary.

### Using Access III.

Operation of the program is essentially very simple. DOS 2 must be booted, then **Access III** is LOADed, using L from the DOS menu. The program will RUN automatically.

The user will be asked to input the filename to be transferred. Only "legal" letters and numbers are accepted, and RETURN enters the name. You are then asked to insert the DOS III disk, and, after RETURN is pressed, the disk will be checked to ensure it is DOS III, after which the dictionary will be searched. If the file isn't found, the user will be told and asked for a DOS III disk again.

This will be repeated until either the correct disk is inserted when the file will be loaded, or the user presses DELETE. Pressing DELETE restarts the process, at whatever stage the program, and this is indicated in the message given in response to pressing the HELP or INVERSE VIDEO (LGO) keys.

The next stage is the saving of the file, which is preceded by a check to ensure that the disk has been changed to DOS 2. Standard CIO calls are used to save the data, so **Access III** could be used with another compatible DOS (even "true" double density), to access DOS III files.

If the file is too large for memory, more than one pass is made to complete the operation. It should be noted that **Access III** does not check the disk on the second time around for the filename, so inserting the wrong disk of the correct DOS type would cause an error which would make the program restart. This was not considered to be a serious problem, as there is no chance of destroying the original, and the user will always be notified of such an error.

After the file has been transferred, the user is asked if there is more to transfer. If the answer is no, the program exits via the warmstart vector.

Two smaller points about **Access III**. . . Holding START will speed up the title routine. Holding all three CONSOL keys down exits through WARMSV, to end the program.

**Access III** was written with Atari's Macro Assembler, to run on any Atari computer of at least 32K, and I've converted the final object code to your standard BASIC binary file-creating program format. □

---

*After starting machine code computing in 1979 using hex keypads, Matthew Jones was technical manager of Efficient Chips (an Atari dealer), later moving to Atari International before freelancing. He has written* ***ViewTerm****, a viewdata terminal program, and is now on a research project at the University of Bath.*

---

**Listing 1.**
**BASIC listing.**

```
10 REM *** ACCESS DOS III ***
30 TRAP 40000:DATA 0,1,2,3,4,5,6,7,8,9
,0,0,0,0,0,0,0,10,11,12,13,14,15
40 DIM DAT$(91),HEX(22):FOR X=0 TO 22:
READ N:HEX(X)=N:NEXT X:LINE=990:RESTOR
E 1000:TRAP 120:? "CHECKING DATA"
50 LINE=LINE+10:? "LINE:";LINE:READ DA
T$:IF LEN(DAT$)<>90 THEN 220
60 DATLIN=PEEK(183)+PEEK(184)*256:IF D
ATLIN<>LINE THEN ? "LINE ";LINE;" MISS
ING!":END
70 FOR X=1 TO 89 STEP 2:D1=ASC(DAT$(X)
)-48:D2=ASC(DAT$(X+1))-48:BYTE=HEX(D1)
*16+HEX(D2)
80 IF PASS=2 THEN PUT #1,BYTE:NEXT X:R
EAD CHKSUM:GOTO 50
90 TOTAL=TOTAL+BYTE:IF TOTAL>999 THEN
TOTAL=TOTAL-1000
100 NEXT X:READ CHKSUM:IF TOTAL=CHKSUM
 THEN 50
110 GOTO 220
120 IF PEEK(195)<>6 THEN 220
130 IF PASS=0 THEN 180
150 PUT #1,224:PUT #1,2:PUT #1,225:PUT
 #1,2:PUT #1,22:PUT #1,32:CLOSE #1:END
160 FOR X=1 TO 90:PUT #1,0:NEXT X:CLOS
E #1:END
180 ? "INSERT DISK WITH DOS, PRESS RET
URN";:DIM IN$(1):INPUT IN$:OPEN #1,8,0
,"D:AUTORUN.SYS"
190 PUT #1,255:PUT #1,255:PUT #1,0:PUT
 #1,32:PUT #1,125:PUT #1,41
210 ? :? "WRITING FILE":PASS=2:LINE=99
0:RESTORE 1000:TRAP 120:GOTO 50
220 ? "BAD DATA: LINE ";LINE:END
1000 DATA 453A9B4B3A9B443A202020202020
2020202020009B00A9048D4B28A9008DDC02AD
1FD0C906D0038DC626A230A9,750
1010 DATA 039D4203A90C9D4A03A9209D4503
A9009D44032056E4A9008DC602A240A9039D42
03A90C9D4A03A9209D4503A9,715
1020 DATA 039D44032056E4206126A901204D
28A9008556 8DF002A9128555A9158554A230A9
0B9D4203A9009D48039D4903,611
1030 DATA A97C2056E4A920A20B9D0720CAD0
FA8E152020AD28C97EF01DC916F01CC99BF012
C92EF076C93090E9C95BB0E5,549
1040 DATA C9419013B01A4C98214C4A21A909
204D2820B0264C4A21C93AB0CAAD1520F0C5AD
AC28AC1520990820C88C1520,876
1050 DATA A230A90B9D4203A9009D48039D49
03ADAC282056E4AD1520C908F025C90BD098A2
30A90B9D4203A9009D48039D,315
1060 DATA 4903A91E2056E420AD28C99BF07C
C97EF02AD0F3A91C8555A9008556A9158554A2
30A90B9D4203A9009D48039D,345
1070 DATA 4903A97C2056E4A9088D15204C99
20A9008D15208556A9138555A9158554AC1520
A230A90B9D4203A9009D4803,329
1080 DATA 9D4903B97C21F0092056E4EE1520
4C59214C64202E2E2E2E2E2E2E7C7C2E2E2E
00A900204D2820B02620B026,760
1090 DATA 4C4A21A9018DF002202224A90620
4D284CAC2100000000A9108DAA21A9008DAB21
A92A8DA921A9808DA821A901,609
1100 DATA 8D0103ADAA218D0A03A9008D0B03
ADA8218D0403ADA9218D0503A9522053E4AD03
03C901D0A2EEAA21ADAA21C9,17
1110 DATA 18F011ADA8211869808DA82190C3
EEA9214CC021A9008D3922A001A92A85D2A980
85D1B1D1D90720D007C8C00C,367
1120 DATA D0F4F02518A91065D185D19002E6
D2EE3922AD3922C93EF005A001D0D900A90A20
4D2820B0264C9D21A000B1D1,616
1130 DATA 2940F0D3A907204D28A9008D7624
8DC3228DC422A00CB1D18D71248D7224C8B1D1
8D7324C8B1D18D7424C8B1D1,184
1140 DATA 8D7524A9018D0103A9188D0A03A9
008D0B03A92A8D0503A9008D0403A9522053E4
AD0303C901D022AD73242078,834
1150 DATA 24CE7124F02DADA921186906CDE6
02B011AC7324B9002A8D73244CA1224C8A2100
00AC7324B9002A8D7324A901,22
1160 DATA 8DC4224CDB22A9008DC422A90420
4D2820AD28C97ED0034C4A21C99BD0F2A9018D
0103A9528D0203A92A8D0503,428
1170 DATA A9008D0403A9008D0B03A9108D0A
032053E4AD0303C901D0AAAD0F2AC9A5F0BEA9
0B204D28ADC322D034A002B9,874
1180 DATA 10209911208810F7A92E8D1020A0
00B90820C920F007C8C008D0F4F01498386907
8D5423A000B910209908 20C8,270
1190 DATA C005D0F5A220A9039D4203A9209D
4503A9069D4403A9080DC3229D4A032056E4C0
01D057A90B9D4203A92A9D45,675
1200 DATA 03A9809D4403ADC422D00FAD7424
9D4803AD75249D49034CAF23ADA82138E9809D
4803ADA921E92A9D49032056,255
1210 DATA E4C001D01CA90C9D42032056E4C0
01D010ADC422D02AA905204D2820B0264C4A21
A900204D28A220A90C9D4203,406
1220 DATA 2056E430EF20B026A903204D2820
B0264C4A21AD722438ED71240A0A8DC526AD75
2438EDC5268D7524AD71248D,807
1230 DATA 7224A9008D7624A9018DC3222022
244C79226868 4C4A21A902204D2820AD28ADAC
28C97EF0ECC99BD0F2A9018D,555
1240 DATA 0103A9528D0203A92A8D0503A980
8D0403A9008D0B03A9108D0A032053E4AD0303
C901F0034CD223A00FB9802A,242
1250 DATA C9A5D0B98888B9802AD0B2600000
0000000000048A9008DAA218DAB21680A2EAB21
0A2EAB210A2EAB2118 69198D,219
1260 DATA AA219003EEAB21AD7624D00AA92A
8DA921A9808DA821A9008D7724A9018D0103AD
AA218D0A03ADAB218D0B03AD,764
```

```
1270 DATA A8218D0403ADA9218D0503A95220
53E4AD0303C901D026EEAA21D003EEAB21ADA8
211869808DA8219003EEA921,512
1280 DATA EE7724AD7724C908D0B7A9FF8D76
24604C8A217D1D1D1D1D20414343455353 20
444F53204949490 11C1E1E1E,263
1290 DATA 1E1E1E1E1E1E1E1E1E1E1E1EA0A0
A0A0A0A0A0A0A0A0A0A0A0A0A01D1D1E1E1E
1E1E1E1E1E1E1E1E1E1E1E1E,691
1300 DATA 1EA0A0A0A0A0A0A0A0A0A0A0A0A0
A0A0A01C1E1E1E1E1E1E1E1E1E1E1E1E1E1E
1EA0C1C3C3C5D3D3A0C4CFD3,925
1310 DATA A0C9C9C9A01D1D1D1D1D1E1E1E1E
1E1E1E1E1E61207574696C6974792070726F
6772616D1D1D1E1E1E1E1E1E,240
1320 DATA 6279204D6174746865772 04A6F6E
65731C1C1E1E1E1E1E1E1E1E1E1E1E1E1E1C
1C1C1C1C1E1E1E66726F6D20,938
1330 DATA 41544152492044 4F5320322E011D
1D1D1D1D1D1D1D1D1D1D1D1D1D1E1E1E1E1E
1E1E1E1E1E1E1E1E1E1E1E1E,643
1340 DATA 111212121212121212120511121212
051D1E1E1E1E1E1E1E1E1E1E1E1E1E1E1E1E
1E1E1E1E1E1E1E1E1E1E4649,867
1350 DATA 4C454E414D45206973207C2E2E2E
2E2E2E2E2E7C7C2E2E2E7C1D1E1E1E1E1E1E
1E1E1E1E1E1E1E1E1A121212,146
1360 DATA 12121212120 31A121212030000A9
248D7026A9008D6026AC6026B9FF24F026C901
F02548A230A9009D48039D49,714
1370 DATA 03A90B9D4203682056E4EE6026AD
6026D0D8EE70264C6B264CC726ADC626D0EA20
B026AD1FD0C906D0E08DC626,123
1380 DATA F0DBA9058DC526A200A00088D0FD
CAD0F8CEC526D0F1600000A510297F85108D0E
D260464154414C204552524F,358
1390 DATA 522D20436865636B20796F757220
6469736B2064726976652E00506C6561736520
656E74657220746865 20444F,273
1400 DATA 532049494920666 96C656E616D65
00496E736572742044 4F53204949492064 6973
6B2C2070726573732052 4554,973
1410 DATA 55524E0046696C65207472616E73
66657220696E636F6D706C6574652E00496E73
65727420444F5320322064 69,863
1420 DATA 736B2C20707265737320524554 55
524E005472616E73666572206F66206669 6C65
20636F6D706C6574652E0053,778
1430 DATA 6561726368696E6720666F722066
696C652E2E2E2E2E2E2E2E2E00466F756E642066
696C652C204C6F6164696E67,520
```

```
1440 DATA 2E2E2E2E2E2E0050726573732044
454C45544520746F2072657374617274005665
7273696F6E20312E31206279,21
1450 DATA 204D6174746865772 04A6F6E6573
0046696C65206E6F7420666F756E642C20506C
6561736520726574727 92E00,973
1460 DATA 536176696E6720666 96C652C2070
6C65617365207761697420 2E2E2E0026D126F5
271727392753277327 8E27A9,739
1470 DATA 27C327DB27F828160000488D4C28
A9128554A9008556AD4B288555A230A9009D48
039D4903A90B9D4203A97E20,784
1480 DATA 56E4A555C903D0E6680AA8B93328
8D9D28B934288D9C28A230A9009D48039D4903
A90B9D4203A4558888888B900,592
1490 DATA 00F0062056E44C8928A5558D4B28
6000ADFC02C9FFD012AD1FD0D0034C74E4ADDC
020DB602D01FF0E7A9008DB6,985
1500 DATA 028DFF02A9408DBE02ADFC02C927
F009C93CF04CD0510800 00A5558DE228AD4C28
8DE128ADE028204D28A9008D,989
1510 DATA DC028DB602A9FF8DFC0220B026AD
E128204D28ADE2288555A9148554A230A90B9D
4203A9009D48039D4903A91D,699
1520 DATA 2056E44CAD28A9FF8DFC02D0F6A2
40A9079D4203A9009D48039D49032056E43004
8DAC2860A9808511A9FF8DFC,980
1530 DATA 0268684C4A21000000000000000000
000000000000000000000000000000000000
000000000000000000000000,373
```

•

## CHECKSUM DATA.

(see page 24)

```
10 DATA 511,496,811,423,729,556,603,55
5,573,694,613,30,940,748,962,9244
190 DATA 549,30,155,511,697,493,71,678
,776,785,532,781,688,990,856,8592
1120 DATA 719,751,587,900,730,855,380,
724,807,663,756,773,584,765,915,10909
1270 DATA 824,792,170,115,995,936,968,
680,63,423,937,896,398,375,420,8992
1420 DATA 357,639,493,513,444,698,787,
989,62,890,996,474,7342
```

•

## Listing 2.
## Assembly listing.

```
; ***********************************
; ******    ACCESS DOS III     ******
; ***  WRITTEN BY M. JONES 1984  ***
; ***********************************
;
; This program was written for two
; reasons.  To fulfill a need, and
; as an experimental exercise.
; Therefore, the actual coding is
; to be taken as such, as much has
; altered since it started life.
; Seemingly meaningless labels
; probably did mean something once!
; I hope the comments provided help
; you understand what you want to
; know, each section was written as
; a module so that should help.
; - Matthew Jones
;
; Operating System Equates
; ------------------------
;
POKMSK   =   $1Ø     ;mask IRQ enable
BRKKEY   =   $11     ;BREAK flag
ROWCRS   =   $54     ;cursor row pntr
COLCRS   =   $55     ;and column pntr
DIRPTR   =   $D1     ;directory pntr
INVFLG   =   $Ø2B6   ;inv video flag
SHFLK    =   $Ø2BE   ;shift-lock flag
COLOR2   =   $Ø2C6   ;playfield 2
HELPFG   =   $Ø2DC   ;HELP key flag
MEMTOP   =   $Ø2E5   ;top of free mem
CRSINH   =   $Ø2FØ   ;cursor inhibit
CH       =   $Ø2FC   ;char buffer
SSFLAG   =   $Ø2FF   ;start/stop flg
DUNIT    =   $Ø3Ø1   ;unit number
DCOMND   =   $Ø3Ø2   ;bus command
DSTATS   =   $Ø3Ø3   ;status return
DBUFLO   =   $Ø3Ø4   ;buffer pntr
DBUFHI   =   $Ø3Ø5
DAUX1    =   $Ø3ØA
DAUX2    =   $Ø3ØB
ICCOM    =   $Ø342   ;CIO command
ICBAL    =   $Ø344
ICBAH    =   $Ø345
ICBLL    =   $Ø348
ICBLH    =   $Ø349
ICAX1    =   $Ø34A
DSKINV   =   $E453   ;disk vector
CIOV     =   $E456   ;CIO vector
WARMSV   =   $E474   ;warmstart
;
; Hardware Registers
;
CONSOL   =   $DØ1F   ;console keys
IRQEN    =   $D2ØE   ;IRQ enable mask
;
         *=  $2ØØØ
;
OPENE    .BYTE "E:",$9B
OPENK    .BYTE "K:",$9B
OPEND    .BYTE "D:"
FILEST   .BYTE "             ",Ø,$9B
FNPTR    .BYTE Ø
;
; INITIALIZE
; ----------
;
; Program actually starts here
;
PRGSTRT  LDA #4         ;initialize data
         STA LLENG
         LDA #Ø
         STA HELPFG     ;clear help flag
         LDA CONSOL     ;speed up title
         CMP #6         ;check START
         BNE OPEN       ;pressed? No.
         STA TPFLAG
;
; OPEN CHANNELS FOR I/O
; ---------------------
;
OPEN     LDX #$3Ø       ;iocb #3
         LDA #$Ø3       ;open
         STA ICCOM,X
         LDA #$ØC       ;read and write
         STA ICAX1,X
         LDA # >OPENE   ;fname = "E:"
         STA ICBAH,X
         LDA # <OPENE
         STA ICBAL,X
         JSR CIOV       ;open editor
         LDA #Ø
         STA COLOR2
;
; E: NOW OPEN ON CHANNEL 3
;
         LDX #$4Ø       ;iocb #4
         LDA #$Ø3       ;open
         STA ICCOM,X
         LDA #$ØC       ;read and write
         STA ICAX1,X
         LDA # >OPENK   ;fname = "K:"
         STA ICBAH,X
         LDA # <OPENK
```

```
         STA ICBAL,X
         JSR CIOV     ;open editor
;
; K: NOW OPEN ON CHANNEL 4
;
; START OF PROGRAM PROPER
; -----------------------
;
         JSR TITLE
START    LDA #1       ;filename prompt
         JSR MSGP
;
; INITIALIZE FOR DATA INPUT
;
         LDA #0       ;< 256 columns!
         STA COLCRS+1
         STA CRSINH   ;cursor on
         LDA #18
         STA COLCRS
         LDA #21
         STA ROWCRS   ;cursor at 18,21
         LDX #$30     ;iocb #3 E:
         LDA #$0B     ;put characters
         STA ICCOM,X
         LDA #0       ;buflen = 0
         STA ICBLL,X  ;data to Acc
         STA ICBLH,X
         LDA #124     ;horiz line char
         JSR CIOV
;
; CURSOR NOW ON DOT
;
         LDA #$20     ;SPACE char
         LDX #$0B
FWIPE    STA FILEST-1,X ;clear fname
         DEX
         BNE FWIPE
         STX FNPTR    ;clear FN pntr
;
; CHARACTER CHECKING AFTER INPUT
; ------------------------------
;
INFILE   JSR KEYCHK   ;get a key
         CMP #126     ;DELETE?
         BEQ FNDEL2   ;Yes. delete
         CMP #22      ;CTRL/V?
         BEQ VERSN    ;version no.
         CMP #$9B     ;RETURN?
         BEQ EOFN2    ;Yes. go checks
         CMP #46      ;full stop?
         BEQ EXTEND   ;Yes. extender
         CMP #48      ;less than 0?
         BCC INFILE   ;yes. refuse it
         CMP #91      ;larger than Z?
         BCS INFILE   ;Yes. refuse it
         CMP #65      ;less than A?
         BCC NUTEST   ;Yes. number?
         BCS PLCHAR   ;insert char
;
EOFN2    JMP EOFN     ;jumps for long
FNDEL2   JMP FNDEL    ;branches
;
VERSN    LDA #9       ;version message
         JSR MSGP
         JSR PAUSE
         JMP FNDEL
;
NUTEST   CMP #'9+1    ;larger than 9?
         BCS INFILE   ;Yes. throw out
         LDA FNPTR    ;test first char
         BEQ INFILE   ;#'s not allowed
PLCHAR   LDA KEY
         LDY FNPTR
         STA FILEST,Y ;put in fname
         INY
         STY FNPTR    ;save it
         LDX #$30     ;iocb3 E:
         LDA #$0B     ;put characters
         STA ICCOM,X
         LDA #0       ;buflen = 0
         STA ICBLL,X  ;data to Acc
         STA ICBLH,X
         LDA KEY
         JSR CIOV
         LDA FNPTR    ;is eight char
         CMP #8       ;limit reached?
         BEQ EXTEND   ;yes. extender
         CMP #$0B     ;end file line?
         BNE INFILE   ;No.
;
; 11 CHARACTERS INPUT NOW
; -----------------------
;
; ONLY RETURN OR DELETE NOW VALID
;
         LDX #$30     ;iocb3 E:
         LDA #$0B     ;put byte
         STA ICCOM,X
         LDA #0       ;zero length
         STA ICBLL,X  ;a data
         STA ICBLH,X
         LDA #30      ;cursor left
         JSR CIOV
EOFL     JSR KEYCHK   ;get a key
         CMP #$9B     ;return?
         BEQ EOFN     ;go for checks
         CMP #126     ;delete?
         BEQ FNDEL    ;Yes.
         BNE EOFL     ;No. loop
;
; EXTEND ROUTINE MOVES CURSOR TO
; EXTENDER POSITION UPON RECEIPT
; OF A DOT INPUT (REGARDLESS OF
; POSITION IN LINE AT PRESENT)
;
EXTEND   LDA #28      ;cursor position
         STA COLCRS
         LDA #0
         STA COLCRS+1
         LDA #21
         STA ROWCRS   ;cursor at 28,21
         LDX #$30     ;iocb3 E:
         LDA #$0B     ;put characters
         STA ICCOM,X
```

```
         LDA #0       ;buflen zero
         STA ICBLL,X  ;data in a
         STA ICBLH,X
         LDA #124     ;vertical line
         JSR CIOV
         LDA #8
         STA FNPTR
         JMP INFILE
;
; CURSOR NOW IN EXTENDER BLOCK
;
; DELETE OPTION HAS BEEN SELECTED,
; WHOLE LINE WILL BE DELETED
;
FNDEL    LDA #0
         STA FNPTR    ;no longer valid
         STA COLCRS+1
         LDA #19
         STA COLCRS
         LDA #21
         STA ROWCRS   ;cursor at 19,21
REDEL    LDY FNPTR
         LDX #$30     ;iocb3 E:
         LDA #$0B     ;put byte
         STA ICCOM,X
         LDA #0
         STA ICBLL,X
         STA ICBLH,X
         LDA DELSTR,Y
         BEQ DELEND   ;end of data
         JSR CIOV
         INC FNPTR
         JMP REDEL
;
DELEND   JMP START
;
DELSTR   .BYTE "........||...",0
;
DERROR   LDA #0       ;disk hardware
         JSR MSGP     ;error or bad
         JSR PAUSE    ;diskette
         JSR PAUSE
         JMP FNDEL
;
; WE HAVE END OF FILE NAME!
; -------------------------
;
; PROGRAM COMES HERE WHEN USER HAS
; PRESSED RETURN TO ENTER THE FNAME.
;
EOFN     LDA #1       ;disable cursor
         STA CRSINH
DOSERR   JSR IIIDSK   ;ensure DOS III
         LDA #6       ;search message
         JSR MSGP
         JMP DOKAY
;
; DISK NOW KNOWN TO BE OKAY
; -------------------------
;
BUFPTR   .WORD 0      ;set up - fetch
SECTOR   .WORD 0      ;of directory
;
DOKAY    LDA #16      ;start directory
         STA SECTOR
         LDA #0
         STA SECTOR+1
         LDA # >DATBUF
         STA BUFPTR+1
         LDA # <DATBUF
         STA BUFPTR
;
; NOW GET DIRECTORY SECTORS
;
GETDIR   LDA #1       ;drive 1
         STA DUNIT
         LDA SECTOR   ;sector number
         STA DAUX1
         LDA #0
         STA DAUX2
         LDA BUFPTR   ;buffer pointer
         STA DBUFLO
         LDA BUFPTR+1
         STA DBUFHI
         LDA #$52     ;get sector
         JSR DSKINV
         LDA DSTATS
         CMP #1       ;okay?
         BNE DERROR
         INC SECTOR
         LDA SECTOR
         CMP #24      ;last sector?
         BEQ FNSEAR   ;Yes.
         LDA BUFPTR
         CLC
         ADC #$80
         STA BUFPTR
         BCC GETDIR
         INC BUFPTR+1
         JMP GETDIR
;
; SEARCH FOR FILENAME
; -------------------
;
FNSEAR   LDA #0       ;init str search
         STA FCTR     ;filecounter
         LDY #1       ;fine pntr
         LDA # >DATBUF ;course pntr
         STA DIRPTR+1
         LDA # <DATBUF
         STA DIRPTR
DIRSER   LDA (DIRPTR),Y
         CMP FILEST-1,Y
         BNE NXTFL    ;wrong
         INY
         CPY #$0C
         BNE DIRSER   ;found it? No.
         BEQ FONDFL   ;check status
;
NXTFL    CLC          ;set pointer to
         LDA #$10     ;next entry
         ADC DIRPTR
         STA DIRPTR
         BCC NXT0
```

```
         INC DIRPTR+1 ;add in carry
NXT0     INC FCTR     ;file counter
         LDA FCTR
         CMP #62
         BEQ NFF      ;no file found
         LDY #1
         BNE DIRSER   ;exam next entry
;
FCTR     .BYTE 0      ;file counter
;
NFF      LDA #$0A     ;file not found
         JSR MSGP
         JSR PAUSE
         JMP DOSERR
;
FONDFL   LDY #0       ;file status
         LDA (DIRPTR),Y ;status byte
         AND #$40     ;mask bit 6
         BEQ NXTFL    ;file not in use
         LDA #7
         JSR MSGP
         LDA #0
         STA KFLAG
         STA APPFLG
         STA MORFLG
;
; GET DATA FROM DIRECTORY BLOCKS
; ------------------------------
;
         LDY #12
         LDA (DIRPTR),Y ;# of blocks
         STA NOBLOK
         STA ONOBLOK
         INY
         LDA (DIRPTR),Y ;first block
         STA NXTBLK
         INY
         LDA (DIRPTR),Y ;pointer low
         STA PEOF
         INY
         LDA (DIRPTR),Y ;pointer high
         STA PEOF+1
GVTOC    LDA #1       ;drive 1
         STA DUNIT
         LDA #24      ;vtoc sector
         STA DAUX1
         LDA #0
         STA DAUX2
         LDA # >VTOC  ;vtoc buffer
         STA DBUFHI
         LDA # <VTOC
         STA DBUFLO
         LDA #$52
         JSR DSKINV
         LDA DSTATS
         CMP #1       ;okay?
         BNE DERR
;
; LOAD BLOCKS FROM FILE
; ---------------------
;
         LDA NXTBLK   ;next block #
LOADBK   JSR KBLOCK   ;get it
         DEC NOBLOK
         BEQ SAVBUF   ;all in- save it
         LDA BUFPTR+1 ;high of buffer
         CLC          ;add 1.5K
         ADC #6       ;for safety
         CMP MEMTOP+1
         BCS NOMEM
;
; OKAY, GET NEXT BLOCK
;
         LDY NXTBLK   ;pntr for next
         LDA VTOC,Y   ;block fetch
         STA NXTBLK
         JMP LOADBK
;
; RANGE JUMPERS
;
DERR     JMP DERROR
;
APPFLG   .BYTE 0      ;append flag
MORFLG   .BYTE 0      ;more data flag
;
NOMEM    LDY NXTBLK   ;fetch pointer
         LDA VTOC,Y   ;for next time
         STA NXTBLK
         LDA #1
         STA MORFLG
         JMP BUFSAV
;
; DATA SAVE
; ---------
;
; DATA NOW ALL IN MEMORY
; SAVE IT USING DOS 2
;
; FIRST CHECK FOR DOS 2 DISK
;
SAVBUF   LDA #0
         STA MORFLG   ;last of appends
BUFSAV   LDA #4       ;'INSERT DOS
         JSR MSGP     ;2 DISK'
S2       JSR KEYCHK
         CMP #126     ;DELETE?
         BNE S1
         JMP FNDEL
;
S1       CMP #$9B     ;RETURN?
         BNE S2
         LDA #1
         STA DUNIT
         LDA #$52     ;get sector
         STA DCOMND
         LDA # >VTOC  ;use vtoc buffer
         STA DBUFHI
         LDA # <VTOC
         STA DBUFLO
         LDA #0       ;directory
         STA DAUX2    ;sector
         LDA #16
         STA DAUX1
         JSR DSKINV
```

```
         LDA DSTATS
         CMP #1
         BNE DERR
         LDA VTOC+15
         CMP #$A5      ;DOS III?
         BEQ BUFSAV    ;loop until II
         LDA #$ØB
         JSR MSGP      ;'SAVING FILE'
;
; EXTENDER MOVER
;
         LDA APPFLG
         BNE ESKIP
         LDY #2        ;3 bytes to move
EMOVE    LDA FILEST+8,Y ;extender
         STA FILEST+9,Y
         DEY
         BPL EMOVE
         LDA #46       ;fullstop
         STA FILEST+8
;
; NOW NEED TO MOVE EXTENDER
; UP TO FILENAME FOR OS
;
         LDY #Ø
MLOOP    LDA FILEST,Y
         CMP #$2Ø      ;SPACE?
         BEQ MOVE      ;Yes. extender
         INY
         CPY #8        ;end of fname?
         BNE MLOOP     ;No.
         BEQ ESKIP     ;no spaces
;
MOVE     TYA           ;prepare to move
         SEC
         ADC # <FILEST-1 ;fancy stuff
         STA MLABEL+1
         LDY #Ø        ;actual move
MLOOP2   LDA FILEST+8,Y
MLABEL   STA FILEST,Y ;this will be
         INY           ;filest+(y),y
         CPY #5        ;all moved?
         BNE MLOOP2    ;No.
ESKIP    LDX #$2Ø      ;iocb 2
         LDA #3        ;open
         STA ICCOM,X
         LDA # >OPEND
         STA ICBAH,X
         LDA # <OPEND
         STA ICBAL,X
         LDA #$Ø8      ;output
         ORA APPFLG    ;and append?
         STA ICAX1,X
         JSR CIOV
         CPY #1
         BNE SERROR    ;error->
         LDA #$ØB      ;put chars
         STA ICCOM,X
         LDA # >DATBUF
         STA ICBAH,X
         LDA # <DATBUF
         STA ICBAL,X
         LDA MORFLG
         BNE ALLBUF
         LDA PEOF
         STA ICBLL,X
         LDA PEOF+1
         STA ICBLH,X
         JMP DUMP
;
ALLBUF   LDA BUFPTR
         SEC
         SBC # <DATBUF
         STA ICBLL,X
         LDA BUFPTR+1
         SBC # >DATBUF
         STA ICBLH,X
DUMP     JSR CIOV
         CPY #1
         BNE SERROR    ;error->
         LDA #$ØC      ;close iocb2
         STA ICCOM,X
         JSR CIOV
         CPY #1
         BNE SERROR
         LDA MORFLG
         BNE MORE
         LDA #5
         JSR MSGP      ;'COMPLETED'
         JSR PAUSE
         JMP FNDEL     ;loop for next
;
SERROR   LDA #Ø        ;fatal error
         JSR MSGP
         LDX #$2Ø
         LDA #$ØC      ;close #2
         STA ICCOM,X
         JSR CIOV
         BMI SERROR    ;loop if error
         JSR PAUSE
         LDA #3        ;transfer was
         JSR MSGP      ;incomplete
         JSR PAUSE
         JMP FNDEL     ;restart
;
MORE     LDA ONOBLOK ;orig # blocks
         SEC
         SBC NOBLOK    ;get difference
         ASL A         ;times 2
         ASL A         ;times 4
         STA PTEMP
         LDA PEOF+1
         SEC
         SBC PTEMP
         STA PEOF+1
         LDA NOBLOK    ;update info
         STA ONOBLOK
         LDA #Ø
         STA KFLAG
         LDA #1
         STA APPFLG
;
; DETAILS DONE, NOW GET III DISK BACK
;
         JSR IIIDSK
         JMP GVTOC
;
; DOS III DISK CONFIRMATION
; -------------------------
;
DELJMP   PLA           ;clear jsr push
         PLA
         JMP FNDEL
;
IIIDSK   LDA #2
         JSR MSGP
III      JSR KEYCHK
         LDA KEY
         CMP #126      ;DELETE?
         BEQ DELJMP    ;yep restart
         CMP #$9B      ;RETURN?
         BNE III
         LDA #1
         STA DUNIT
         LDA #$52      ;get sector
         STA DCOMND
         LDA # >DATBUF
         STA DBUFHI
         LDA # <DATBUF
         STA DBUFLO
         LDA #Ø
         STA DAUX2
         LDA #$1Ø      ;dir sector
         STA DAUX1
         JSR DSKINV
         LDA DSTATS
         CMP #1
         BEQ DOSCHK
         JMP SERROR
;
DOSCHK   LDY #15       ;DOS III
         LDA DATBUF,Y ;identifier
         CMP #$A5      ;byte
         BNE IIIDSK
         DEY
         DEY
         LDA DATBUF,Y
         BNE IIIDSK
         RTS
;
; NOTE NO CHECK TO ENSURE
; SAME DISK SECOND TIME ROUND
;
NOBLOK   .BYTE Ø
ONOBLOK  .BYTE Ø
NXTBLK   .BYTE Ø
PEOF     .WORD Ø
KFLAG    .BYTE Ø       ;if <>Ø, buffer
KTEMP    .BYTE Ø       ;pntr not reset
;
KBLOCK   PHA           ;K blk # in Acc
         LDA #Ø        ;clear sector #
         STA SECTOR
         STA SECTOR+1
         PLA           ;sector=8*kb+25
         ASL A         ;kb*2
         ROL SECTOR+1 ;if carry +1
         ASL A         ;kb*4
         ROL SECTOR+1
         ASL A         ;kb*8
         ROL SECTOR+1
         CLC
         ADC #25
         STA SECTOR
         BCC K1
         INC SECTOR+1 ;sector set up
K1       LDA KFLAG     ;reset pointer?
         BNE K3
         LDA # >DATBUF
         STA BUFPTR+1
         LDA # <DATBUF
         STA BUFPTR
K3       LDA #Ø
         STA KTEMP     ;sector count
KSEC     LDA #1        ;drive 1
         STA DUNIT
         LDA SECTOR
         STA DAUX1
         LDA SECTOR+1
         STA DAUX2
         LDA BUFPTR
         STA DBUFLO
         LDA BUFPTR+1
         STA DBUFHI
         LDA #$52      ;get sector
         JSR DSKINV
         LDA DSTATS
         CMP #1        ;okay?
         BNE KERROR
         INC SECTOR
         BNE K2        ;Ø? byte cycled
         INC SECTOR+1 ;inc high byte
K2       LDA BUFPTR
         CLC
         ADC #$8Ø
         STA BUFPTR
         BCC K2A
         INC BUFPTR+1
K2A      INC KTEMP
         LDA KTEMP
         CMP #8        ;got 8 sectors?
         BNE KSEC      ;No.
         LDA #$FF
         STA KFLAG     ;stop alteration
         RTS           ;of pointer
;
KERROR   JMP DERROR
;
; TITLE SEQUENCE DATA
; -------------------
;
; NOW FOLLOWS BYTES OF TITLE INFO
;
TITLST   .BYTE 125,29,29,29,29,29
         .BYTE " ACCESS DOS III"
         .BYTE 1,28,3Ø,3Ø,3Ø,3Ø,3Ø,3Ø
         .BYTE 3Ø,3Ø,3Ø,3Ø,3Ø,3Ø,3Ø
         .BYTE 3Ø,3Ø
         .BYTE +$8Ø,"          "
         .BYTE +$8Ø,"          "
         .BYTE 29,29,3Ø,3Ø,3Ø,3Ø,3Ø
         .BYTE 3Ø,3Ø,3Ø,3Ø,3Ø,3Ø,3Ø
         .BYTE 3Ø,3Ø,3Ø,3Ø
         .BYTE +$8Ø,"          "
         .BYTE +$8Ø,"          "
         .BYTE 28,3Ø,3Ø,3Ø,3Ø,3Ø
         .BYTE 3Ø,3Ø,3Ø,3Ø,3Ø,3Ø,3Ø
         .BYTE 3Ø,3Ø,3Ø,3Ø
         .BYTE +$8Ø," ACCESS DOS"
         .BYTE +$8Ø," III "
         .BYTE 29,29
         .BYTE 29,29,29,3Ø,3Ø,3Ø,3Ø
         .BYTE 3Ø,3Ø,3Ø,3Ø,3Ø,3Ø
         .BYTE "a utility program"
         .BYTE 29,29,3Ø,3Ø,3Ø,3Ø,3Ø
         .BYTE 3Ø,"by Matthew Jones"
         .BYTE 28,28,3Ø,3Ø,3Ø,3Ø,3Ø
         .BYTE 3Ø,3Ø,3Ø,3Ø,3Ø,3Ø,3Ø
         .BYTE 3Ø,3Ø,28,28,28,28,28
         .BYTE 3Ø,3Ø,3Ø
         .BYTE "from ATARI DOS 2.",1
         .BYTE 29,29,29,29,29,29,29
         .BYTE 29,29,29,29,29,29,29
         .BYTE 29,3Ø,3Ø,3Ø,3Ø,3Ø,3Ø
         .BYTE 3Ø,3Ø,3Ø,3Ø,3Ø,3Ø,3Ø
         .BYTE 3Ø,3Ø,3Ø,3Ø,17,18,18
         .BYTE 18,18,18,18,18,18,5,17
         .BYTE 18,18,18,5,29,3Ø,3Ø,3Ø
         .BYTE 3Ø,3Ø,3Ø,3Ø,3Ø,3Ø,3Ø
         .BYTE 3Ø,3Ø,3Ø,3Ø,3Ø,3Ø,3Ø
         .BYTE 3Ø,3Ø,3Ø,3Ø,3Ø,3Ø,3Ø
         .BYTE 3Ø,3Ø,3Ø
         .BYTE "FILENAME is |...."
         .BYTE "....||...|"
         .BYTE 29,3Ø,3Ø,3Ø,3Ø
         .BYTE 3Ø,3Ø,3Ø,3Ø,3Ø,3Ø,3Ø
         .BYTE 3Ø,3Ø,3Ø,3Ø,26,18,18
         .BYTE 18,18,18,18,18,18,3,26
         .BYTE 18,18,18,3,Ø
TCOUNT   .BYTE Ø
;
; TITLE PRINTING ROUTINE
; ----------------------
;
TITLE    LDA # >TITLST
         STA TINC+2
         LDA #Ø        ;reset pointer
         STA TCOUNT
TPRINT   LDY TCOUNT    ;set index
TINC     LDA TITLST,Y ;load character
         BEQ TEND      ;Ø = end of data
         CMP #1        ;1 = pause it
         BEQ JPAUSE
         PHA           ;push byte
         LDX #$3Ø      ;iocb #3
         LDA #Ø        ;length = Ø
         STA ICBLL,X
         STA ICBLH,X
         LDA #$ØB      ;cio put byte
         STA ICCOM,X
         PLA
         JSR CIOV
TNEXT    INC TCOUNT
         LDA TCOUNT
         BNE TPRINT
         INC TINC+2
         JMP TPRINT    ;loop until done
;
TEND     JMP BRKDIS    ;disable break
;
JPAUSE   LDA TPFLAG
         BNE TNEXT
         JSR PAUSE
         LDA CONSOL
         CMP #6
         BNE TNEXT
         STA TPFLAG
         BEQ TNEXT
;
PAUSE    LDA #5
         STA PTEMP
PLOOP    LDX #Ø
XLOOP    LDY #Ø
YLOOP    DEY
         BNE YLOOP
         DEX
         BNE XLOOP
         DEC PTEMP
         BNE PLOOP
         RTS
;
PTEMP    .BYTE Ø
TPFLAG   .BYTE Ø
;
; END OF TITLE PRINT
;
BRKDIS   LDA POKMSK    ;current status
         AND #$7F      ;disable BREAK
         STA POKMSK    ;put it back
         STA IRQEN     ;and to hardware
         RTS
;
; NOW COMES THE PROMPT PRINTER
; ----------------------------
;
MSGØ     .BYTE "FATAL ERROR- Check "
         .BYTE "your disk drive.",Ø
MSG1     .BYTE "Please enter the DOS"
         .BYTE " III filename",Ø
MSG2     .BYTE "Insert DOS III disk,"
         .BYTE " press RETURN",Ø
MSG3     .BYTE "File transfer "
         .BYTE "incomplete.",Ø
MSG4     .BYTE "Insert DOS 2 disk, "
         .BYTE "press RETURN",Ø
MSG5     .BYTE "Transfer of file "
         .BYTE "complete.",Ø
MSG6     .BYTE "Searching for "
         .BYTE "file........",Ø
MSG7     .BYTE "Found file, "
         .BYTE "Loading......",Ø
MSG8     .BYTE "Press DELETE to "
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        .BYTE "restart",0
MSG9    .BYTE "Version 1.1 by "
        .BYTE "Matthew Jones",0
MSGA    .BYTE "File not found, "
        .BYTE "Please retry.",0
MSGB    .BYTE "Saving file, please "
        .BYTE "wait ...",0
;
;
MSGTBL  .DBYTE MSG0,MSG1,MSG2,MSG3
        .DBYTE MSG4,MSG5,MSG6,MSG7
        .DBYTE MSG8,MSG9,MSGA,MSGB
LLENG   .BYTE 0
LSTMSG  .BYTE 0
;
;  PROMPT MESSAGE PRINTER
;  ----------------------
;
MSGP    PHA             ;save line
        STA LSTMSG      ;for 'HELP' use
        LDA #18         ;19 lines down
        STA ROWCRS
        LDA #0          ;<256 columns
        STA COLCRS+1
        LDA LLENG       ;set line length
        STA COLCRS      ;to column #
DELETE  LDX #$30
        LDA #0          ;buflen = 0
        STA ICBLL,X     ;data to Acc
        STA ICBLH,X
        LDA #$0B        ;cio put byte
        STA ICCOM,X
        LDA #$7E        ;BACKSPACE
        JSR CIOV
        LDA COLCRS      ;all deleted?
        CMP #3
        BNE DELETE      ;No. do another
        PLA             ;pop message #
        ASL A           ;times 2
        TAY             ;use as index
        LDA MSGTBL,Y    ;msg addr hi
        STA MSGSTR+2
        LDA MSGTBL+1,Y  ;msg addr lo
        STA MSGSTR+1
        LDX #$30        ;iocb#3
PPRINT  LDA #0          ;buflen = 0
        STA ICBLL,X
        STA ICBLH,X
        LDA #$0B        ;put byte
        STA ICCOM,X
        LDY COLCRS      ;get the y index
        DEY
        DEY
        DEY             ;goto beginning
MSGSTR  LDA $00,Y       ;filled earlier
        BEQ PEND        ;finish? Yes.
        JSR CIOV
        JMP PPRINT      ;loop round
;
PEND    LDA COLCRS      ;how much data?
        STA LLENG       ;save it
        RTS
;
;  KEY INPUT ROUTINE
;  -----------------
;
KEY     .BYTE 0
;
KEYCHK  LDA CH          ;get key
        CMP #$FF
        BNE KEYIN       ;anything?
        LDA CONSOL      ;console keys
        BNE KEYC1       ;all pressed?
        JMP WARMSV      ;Yes. RESET
KEYC1   LDA HELPFG      ;help?
        ORA INVFLG      ;inverse?
        BNE HELP
        BEQ KEYCHK
;
KEYIN   LDA #0          ;key pressed
        STA INVFLG      ;clear inverse
        STA SSFLAG      ;clr STOP flg
        LDA #$40        ;and shifts
        STA SHFLK
        LDA CH
        CMP #$27        ;atari logo key?
        BEQ HELP
        CMP #$3C        ;caps lock?
        BEQ NOGO        ;not allowed
        BNE GETKEY
;
HELPMSG .BYTE 8
HLSTMSG .BYTE 0
HELPCOL .BYTE 0
;
HELP    LDA COLCRS      ;save
        STA HELPCOL     ;cursor position
        LDA LSTMSG      ;save
        STA HLSTMSG     ;last message #
        LDA HELPMSG     ;get current
        JSR MSGP        ;help message
        LDA #0          ;clr help flags
        STA HELPFG
        STA INVFLG
        LDA #$FF
        STA CH
        JSR PAUSE       ;wait a moment
        LDA HLSTMSG     ;restore
        JSR MSGP        ;last message
        LDA HELPCOL
        STA COLCRS
        LDA #20
        STA ROWCRS
        LDX #$30        ;iocb3 e:
        LDA #$0B        ;put chars
        STA ICCOM,X
        LDA #0          ;buflen = 0
        STA ICBLL,X     ;data to Acc
        STA ICBLH,X
        LDA #29         ;cursor down
        JSR CIOV
HPX     JMP KEYCHK
;
NOGO    LDA #$FF
        STA CH          ;clear keypress
        BNE HPX
GETKEY  LDX #$40        ;K: is iocb 4
        LDA #$07        ;get character
        STA ICCOM,X
        LDA #0          ;buflen = 0
        STA ICBLL,X     ;data to Acc
        STA ICBLH,X
        JSR CIOV
        BMI KEYBRK      ;break or ctrl3
        STA KEY
        RTS
;
KEYBRK  LDA #$80        ;BREAK! restart
        STA BRKKEY      ;clr break flag
        LDA #$FF        ;and key
        STA CH
        PLA             ;clear jsr
        PLA
        JMP FNDEL
;
VTOC    =   [*+$0100]&$FF00
DATBUF  =   VTOC+128
;
        *=  $02E0
        .WORD PRGSTRT
        .END
```

●


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# ON-LINE

## Getting in on the Action!

**by Russ Wetmore**

Action! is an Atari programmer's dream come true. It is a language not too unlike C or Pascal, but which compiles to very "tight" 6502 machine language. Clint Parker, the author of Action!, has fashioned a remarkable programming environment, where editor, compiler and monitor are all resident at once.

Write your program, compile it, run to test it, then dump right back into the editor with your source code intact, to start making corrections. I've done a couple of major projects using Action! in the past year and can recommend it without hesitation to any serious (or casual) Atari programmer.

There are several *caveats* in creating really big programs (larger than 16K), because of the integrated environment. If you're planning to write such programs, it's necessary to know how Action! creates object code from your source, in order to maximize memory usage. There are also a few bugs that need to be noted.

In this article (and the one next month), I'll show you some tricks I've learned to optimize Action!'s output. These comments all apply to version 3.6—they may work on other versions of the compiler, but have not been tested. They also assume a working knowledge of Action!

### Variable allocation.

*Allocating free memory.*

There isn't a function in Action! that approximates BASIC's FRE(0) command. It isn't as simple as checking the monitor to see where the end of your program is, because Action! tries to help you out by placing some non-initialized arrays beyond the end of your program code, instead of inside your program, where they're declared (specifically, CARD ARRAYs and, generally, BYTE ARRAYs over a page in length).

Luckily, there's an easy method for determining where the end of the program and variable space actually is. The first CARD ARRAY declared in a program is the *last* actually allocated during compilation.

```
MODULE ; Sample 1

CARD
  MEMTOP=$2E5, freemem=[0]
CARD ARRAY
  EndOfProgram(1)

PROC Main()
  freemem=MEMTOP - EndOfProgram
  PrintF("Total free memory=%U%E",
         freemem)
RETURN
```

*Static ARRAY variables.*

Action! allows you a lot of choices when it comes to variable declaration. For example, ARRAY variable names are actually *pointers* to the ARRAY space. This allows you to do such esoterics as:

```
MODULE ; Sample 2

CHAR ARRAY
  str1="This is a test.", str2

PROC Main()
  str2=str1
  PrintE(str2)
RETURN
```

When you run the program, you'll find that str1 and str2 both "equal" the same string. This is possible because Action! also allocates a *pointer* to the ARRAY, in addition to the ARRAY data itself. When you assign str2 to str1, you're actually just assigning str2's pointer equal to str1's, which is pointing to the ARRAY data.

In many cases, though, this overhead costs memory for arrays that you're never going to reassign, such as string constants. Also, if you were to reference the ARRAY name in a code block, you'd have to go through contortions in order to get to the actual data, because the ARRAY name equals a pointer to the data, which you'd have to access indirectly. Clint very thoughtfully put in a construct that allows you to declare ARRAY variables *without* the associated pointer. Declare the ARRAY with a predefined length of 0. For example:

```
CHAR ARRAY
  str1(0)="This is a test."
```

You won't be able to reassign str1 (you'll get an error if you try), but you will have saved 2 bytes you probably never would have used, anyway. You'll also save 2 bytes every time you reference the ARRAY, because Action! will compile the reference as immediate loads of registers, as opposed to indirect fetches from memory. For example:

```
MODULE ; Sample 3a

CHAR ARRAY
  str1="This is a test."

PROC Main()
  PrintE(str1)
RETURN
```

compiles to:


# 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).

**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 or 24 ($4.00 each) or the **ANALOG Compendium** ($14.95 plus $2.00 shipping and handling from:

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```
MAIN    LDA stri
        LDX stri+1
        JSR PrintE
        RTS
```

*whereas* the following:

```
MODULE ; Sample 3b

CHAR ARRAY
  str1(0)="This is a test."

PROC Main()
  PrintE(str1)
RETURN
```

compiles to:

```
MAIN    LDA #<str1
        LDX #>str1
        JSR PrintE
        RTS
```

For similar reasons, you may save memory if you predeclare *all* your variables, ARRAYs or otherwise. For example, when you declare a BYTE variable, you can set its memory address in the declaration. Any variables that follow it in the same statement, though, have extra overhead associated with them. (You can see this effect in the following example.) To test all of these constructs, you can compile a test program then execute the command *?$493* from the monitor, to see the program's length. Try this with the following two examples:

```
MODULE ; Long example

BYTE
  COLOR1=$2C4, i, j, k
CARD
  MEMTOP=$2E5, c, d, e
CHAR ARRAY
  str1="Test1", str2="Test2"

PROC Main()
RETURN
```

```
MODULE ; Shorter example

BYTE
  COLOR1=$2C4, i=[0], j=[0], k=[0]
CARD
  MEMTOP=$2E5, c=[0], d=[0], e=[0]
CHAR ARRAY
  str1(0)="Test1", str2(0)="Test2"

PROC Main()
RETURN
```

You'll find that the second example ends up being 19 bytes shorter than the first.

*A string shortcut.*

If you work with strings at all, you probably know that the length of a declared string is always the first ("zeroth") byte of the ARRAY. As such, you probably use a construct similar to:

```
MODULE ; Sample 4a

CHAR ARRAY
  str1="Test"

PROC Main()
  PrintF("Length of %S is %U%E",
         str1, str1(0))
RETURN
```

You can save considerable memory (11 bytes each occurrence!) by declaring a separate BYTE variable:

```
MODULE ; Sample 4b

CHAR ARRAY
  str1="Test"

BYTE
  str1len=str1

PROC Main()
  PrintF("Length of %S is %U%E",
         str1, str1len)
RETURN
```

By making the declaration *str1len = str1*, we're setting str1len's memory location equal to the "zeroth" byte of str1, hence str1len will always be equal to the length of str1 (if you don't point str1 elsewhere). The reason for the memory savings is simple. In the first example, the compiler is given the address of the start of the ARRAY and an offset to the actual byte desired. This compiles to something similar to:

```
LDA str1     ;Fetch address of array
STA $AE      ;Save for indirect ref
LDA str1+1   ;Fetch high byte
STA $AF      ;Save...
LDY #0       ;We want 0'th element
LDA ($AE),Y  ;Fetch string length
```

If we declare a BYTE variable outright, though, it will already be pointing to the proper memory location, and no calculation is needed to find it. Thus, the compiler produces something like:

```
LDA str1len ;Fetch string length
```

which, I think you'll agree, is much cleaner. You can apply this principle to *any* portion of a declared ARRAY that isn't going to move, that you need to access.

### PROC and FUNC addressing.

In the Action! manual, reference is made to "addressing routines." Besides the example given, there's little said about how useful this construct can be.

*Forward references.*

Action! is a one-pass compiler. Most compilers use a two-pass method, where the entire source program is scanned first to build a symbol table of variable addresses. Thus, on the second pass, if a variable is used before it is declared, the compiler can look it up in the symbol table to find its address.

Action!, however, only makes one pass through a program for speed reasons. This means that every procedure or function is supposed to be previously declared before you reference it. Sometimes this isn't feasible, but how do you get around it?

One other feature of Action! is the ability to reassign PROCs and FUNCs to different memory locations from where they are first compiled. If you run the following example:

```
MODULE ; Sample 5

PROC Num1() PrintE("ONE") RETURN

PROC Num2() PrintE("TWO") RETURN

PROC Main()
  Num2=Num1 Num2()
RETURN
```

you'll get the result *one* printed to the screen, because we've "pointed" Num2 to Num1's address. Using this same concept, we can forward reference a PROC or FUNC before it is declared!

```
MODULE ; Sample 6

PROC DUMMY()

PROC Num1() DUMMY() RETURN

PROC Num2() PrintE("TWO") RETURN

PROC Main()
  DUMMY=Num2 Num1()
RETURN
```

In Num1, we've actually forward referenced Num2 indirectly, by setting DUMMY to be equal to Num2.

*An indirect detriment.*

Unfortunately, as in the case of non-initialized ARRAYs, the overhead for such indirection is the default case. I have very rarely used the addressing feature and, even then, only in cases where I was too lazy to redo the necessary routines properly.

Action! compiles normal PROC references in a manner similar to this example:

```
MODULE ; Sample 7

BYTE
  test

PROC DUMMY()
RETURN

PROC Main()
  PrintBE(test)
RETURN


test      .DS 1

DUMMYvec  JMP DUMMY
DUMMY     RTS

Mainvec   JMP Main
Main      LDA test
          JSR PrintBE
          RTS
```

If you were to do the assignment DUMMY = Main, what the compiler would actually produce is:

```
LDA #<Main
STA DUMMYvec+1
LDA #>Main
STA DUMMYvec+2
```

so that the resulting code at DUMMYvec would actually become JMP Main. If you don't ever use this feature, though, every time you declare a PROC or FUNC, you're actually throwing in a JMP to the next instruction.

The way to avoid this automatic inclusion of the JMP command is to use the construct:

```
PROC procname=*()
```

You save three bytes and a little overhead in speed when you declare routines this way. One important note—this construct will *not* work if you're passing variables to a routine, unless the first thing encountered in the routine is a code block. This is because of the way that Action! handles saving its zero-page working variables.

*Modularizing programs.*

You can also use this construct to "modularize" your programs. This is important if you're trying to compile large programs. Frequently, you'll run out of symbol table space or, worse yet, run out of memory to compile to because the cartridge eats 8K of space itself, in addition to other overhead.

You can compile all of your constant strings and low level routines, for example, separately from your main program and reference them in your program through equates and routine addressing. You can then use the SET command in the second module to compile the second module above the first, then append your files together to get the final object file. I'll go more into detail on how to do this next issue.

Also, next time I'll cover ARRAYs of ARRAYs (string ARRAYs, for example), an Action! version of BASIC's "ON x GOSUB" and "ON x GOTO" commands, plus other surprises. □

---

*Russ Wetmore has been involved in the home computer industry for over six years. He's probably most widely known for his best-selling, award-winning Atari game program **Preppie!** He has also shown his talent as a composer/arranger whose work has been heard on national TV. Russ is President of Star Systems Software, Inc., a research and development firm specializing in entertainment and home productivity programs for a host of computers.*

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CIRCLE #112 ON READER SERVICE CARD

# Home-made TRANSLATOR

by Angelo Giambra

By now everyone who owns an Atari XL computer has heard of the "translator." It's software that loads into your XL and makes it think it's an Atari 800. It was developed because many games and software products have compatibility problems running on the XL. Versions of different translators can be purchased for from $9.95 to $69.95. Some of the more expensive ones boast that they give your XL an extra 4K of useable RAM.

If you have an 800XL with a disk drive, and if you have access to an older 800 machine, you can create your own **Home-Made Translator** that's better than the "official" translator disk from Atari. Why better? Three reasons.

First, the Atari translator comes as a boot disk. That is, you can't use the disk for storage of any files. Your **Home-Made Translator** is an AUTORUN.SYS file, leaving plenty of room on the disk.

More importantly, the **H-M Translator** will free up 4K of RAM, just like the more expensive translators. When you use it with software like **Letter Perfect**, you'll be able to create larger documents in memory.

Third, you only have to boot it once. With the Atari translator, every time you want to load different software you must first reboot from the translator disk. Your **H-M Translator** will allow you to switch software without rebooting the translator software.

If you belong to an Atari users group you should have no problem locating someone who owns an Atari 800. Or you may have a friend with one of the older machines. If so, here's all you have to do.

### Home-Making it.

Key in the BASIC program in Listing 1 and SAVE it on your disk. (You may key it in on either an XL machine or an older machine.) Now, gain access to an 800 computer with a disk drive. The older machine must be equipped with version B of the operating system. To check which version the machine has, key in the following from BASIC: *PRINT PEEK (58383)*. A *0* should print if you have version B. If you get a *56*, you have version A and must use a different machine.

Boot the computer from any DOS, then LOAD and RUN the program you keyed from Listing 1. It will create an AUTORUN.SYS file on your disk. This is your **H-M Translator**. Here's how to use it.

Place the disk containing the AUTORUN.SYS file in your disk drive and boot normally. If your software needs the BASIC cartridge present (or you're using some other cartridge which boots from disk), do not press the OPTION key while booting. Otherwise, hold the OPTION key down until you hear the drive begin to boot.

When the system boots, the message *PRESS SELECT* will appear on your screen. If you didn't press the OPTION key, you will also see the message *CAR-*

TRIDGE PRESENT. Remove the disk containing the **H-M Translator**. If your software's on disk, insert the software disk and press the SELECT key. If your software is on cassette, press the SELECT key, then hold down START.

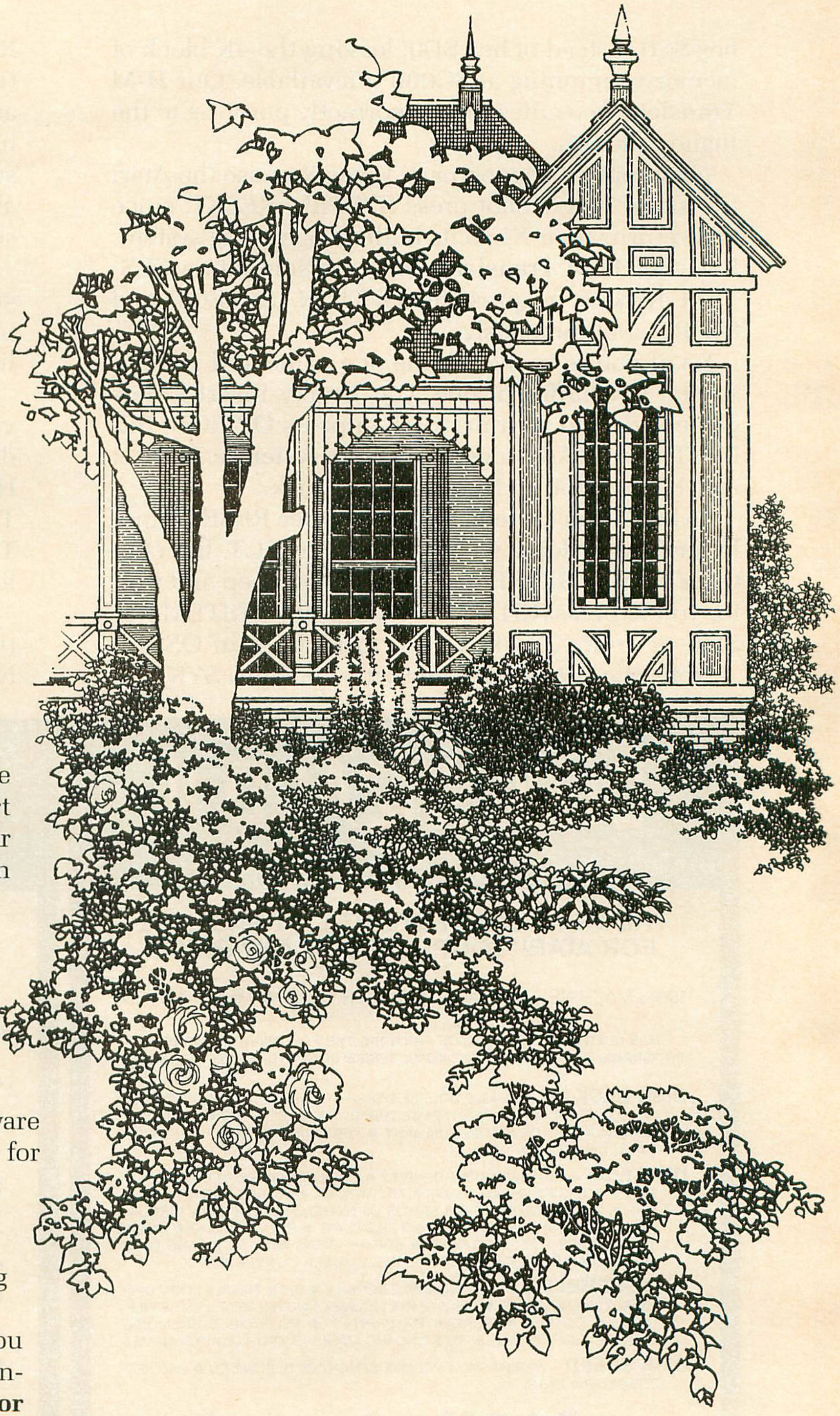
The version B operating system from the older machine will take control of your machine by disabling the built-in OS ROM. The default background color will change to a darker blue, making it easy for you to tell when the **H-M Translator** is present.

Your system will begin booting from the software disk or will beep, signalling you to press RETURN for a normal cassette boot. (It isn't necessary to hold down the OPTION key during this second boot process.) A good many software products which don't run on the XL machine will run when using the **H-M Translator**.

Even if your software does run on your XL, you may want to use this same procedure, to take advantage of the extra 4K of memory the **H-M Translator** gives you. For instance, you may prefer running **Letter Perfect** under the **H-M Translator** to create larger documents in memory.

The extra 4K of memory is gained because the OS from the older 800 machine uses only 10K of RAM. The newer OS in the XL uses 14K of ROM. The Atari translator incorrectly points the RAMTOP register to

(continued on next page)



*Angelo Giambra is a Senior Analyst/Programmer for Marine Midland Bank in New York. With a B.A. in English Literature, he has been in the data processing field for eight years. An avid Atari hobbyist and incessant tinkerer, he enjoys writing machine language utilities and extensions to the OS and DOS.*

hex $C0 instead of hex $D0, leaving the 4K block of memory beginning at $C000 unavailable. Our **H-M Translator** remedies this by correctly pointing to the higher address.

Now comes the good part. When you use the Atari translator you cannot press SYSTEM RESET, since this returns your XL to its built-in operating system. But your **H-M Translator** lets you simulate a SYSTEM RESET by pressing OPTION, SELECT and START simultaneously.

So, if you're in the middle of a game and want to switch to a different one, you simply insert a new game disk into your drive, then press OPTION, SELECT and START together—your system will reset and begin booting from the new disk.

To boot from cassette, press the three RESET simulation keys, release OPTION and SELECT, but continue holding START. Your system will beep and wait for you to press RETURN. Never press SYSTEM RESET, or your XL will return to its built-in OS.

Note: the **H-M Translator** can simulate a SYSTEM RESET because of a minor change to the deferred vertical blank interrupt (VBI) service routine. As long as the software you're using doesn't disable this VBI, it will work. In testing, I found that some software substitutes its own VBI routine, so the RESET won't always work. You should have no trouble with most software, however.

Also, be aware that the **H-M Translator** only gives you 4K of extra RAM if you boot your system without BASIC (by pressing the OPTION key during the initial boot).

If you have a very steady hand and are a bit lucky, you can even run cartridges which do not boot from disk under the **H-M Translator**. Here's how. After your **H-M Translator** is loaded into memory, press OPTION, SELECT and START together, then release OPTION and SELECT. The system will beep, preparing for a cassette boot.

Slowly insert a cartridge into the cartridge slot until you feel it touch bottom. Then quickly and firmly push it into place. If you don't do this part just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right, your system will lock up. If you were quick enough, you can now press OPTION, SELECT and START to boot into the cartridge.

To switch to another cartridge, use the same procedure. Press the three reset keys, then hold START. You must pull the first cartridge out quickly and evenly. I won't guarantee this procedure, but it works often enough to be useable.

If you're concerned about putting a cartridge into your machine while it's turned on, don't be. It's perfectly safe, or Atari wouldn't have left an exposed slot where kids and adults who don't read manuals could blow cartridges left and right. If you don't believe me, believe Bill Wilkinson. The above is a paraphrase of a comment he made on the very same subject.

For you hard-core machine language programmers out there, here's an opportunity to really have some fun. If you have a good debugging tool, such as BUG65, you can create your own custom versions of the OS and try all kinds of weird and wonderful things. How? Simple.

Boot from the **H-M Translator** disk into BASIC. Now get into your debugging software and snoop around the OS, using a disassembler and/or a copy of the OS listing (available from Atari). If you're using BUG65, OSS can provide you with instructions on how to enter BUG65 from BASIC. Write for their latest bulletin.

Remember, while you're under the **H-M Translator**, the OS resides in RAM, not ROM. That means you can alter it! Of course, you must take great care when messing around with the OS, but you can do some pretty nifty stuff—like change the default background colors or speed up the cursor, etc.

The program in Listing 1 disables the key click by changing the JSR to this routine to NOPs. It then uses the addresses where the key click routine resides for a small addition to the VBI service routine. This routine checks to see if OPTION, SELECT and START are pressed, and jumps to the power-up routine if they are.

You can modify the OS using the built in assembler in BUG65, or if you're very brave, you can poke the changes in from BASIC. Once the OS is modified, you can create a new **H-M Translator** by simply running the program in Listing 1 again on your XL machine. It will copy the modified version of your OS down into a new **H-M Translator** file.

You see, it just goes to show. Home-made is always better! □

*(Program listing starts on page 33)*


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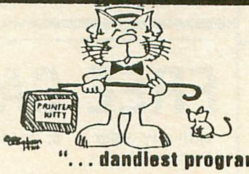


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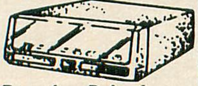

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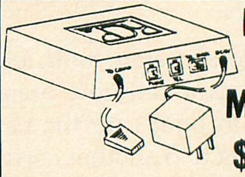

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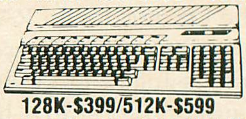

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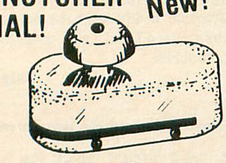

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# Translator *continued*

### Listing 1.
### BASIC listing.

```
10 I=12288
20 READ A:IF A=-1 THEN 40
30 POKE I,A:I=I+1:GOTO 20
40 OPEN #1,8,0,"D:AUTORUN.SYS"
50 PUT #1,255:PUT #1,255
60 PUT #1,0:PUT #1,56
70 PUT #1,255:PUT #1,95
80 X=USR(12288)
90 TRAP 120
100 READ A
110 PUT #1,A:GOTO 100
120 PUT #1,224:PUT #1,2:PUT #1,225:PUT
 #1,2
130 PUT #1,0:PUT #1,48
140 CLOSE #1
150 DATA 104,160,0,162,0,185,0,216,157
,0,49,232,200,16,246,32,42,48,162,0,18
5,0,216,157
160 DATA 0,49,232,200,208,246,32,42,48
,238,7,48,238,22,48,208,216,96,162,16,
169,11,157,66
170 DATA 3,169,0,157,68,3,169,49,157,6
9,3,169,128,157,72,3,169,0,157,73,3,15
2,72,32
180 DATA 86,228,104,168,96,-1
190 DATA 255,255,231,70,233,70,234,234
,234,190,72,192,72,76,216,252
200 DATA 46,81,48,81,32,68,242,63,82,6
7,82,201,208,208,28,96
210 DATA 103,82,104,82,208,218,116,82,
118,82,76,63,242,10,89,10
220 DATA 89,96,251,86,253,86,234,234,2
34,195,94,195,94,144,216,92
230 DATA 226,92,173,31,208,240,3,108,3
6,2,76,119,228,131,82,133
240 DATA 82,234,234,234
250 DATA 0,48,216,48,169,12,141,66,3,1
62,0,32,86,228,160,14,185,202,48,153,2
6,3,136
260 DATA 16,247,169,199,141,68,3,169,4
8,141,69,3,169,3,141,66,3,169,12,141,7
4,3,32,86,228
270 DATA 169,11,141,66,3,169,152,141,6
8,3,169,48,141,69,3,169,19,141,72,3,16
9,0,141,73,3
280 DATA 169,1,141,240,2,32,86,228,173
,1,211,41,2,208,23,169,171,141,68,3,16
9,48,141,69,3
290 DATA 169,28,141,72,3,169,0,141,73,
3,32,86,228,173,31,208,201,5,208,249,1
69,0,141,14,212
300 DATA 141,14,210,173,1,211,41,254,1
41,1,211,160,0,185,0,56,153,0,216,200,
208,247,238,134,48
310 DATA 238,137,48,208,237,76,119,228
,125,29,29,29,127,127,80,82,69,83,83,3
2,211,197,204,197,195
320 DATA 212,155,29,29,127,32,32,32,32
,32,32,40,67,65,82,84,82,73,68,71,69,3
2,80,82,69
330 DATA 83,69,78,84,41,69,58,155,80,4
8,228,67,64,228,69,0,228,83,16,228,75,
32,228
```

●

### CHECKSUM DATA.
*(see page 24)*

```
10 DATA 535,321,419,32,987,619,797,113
,473,630,721,236,864,647,922,8316
160 DATA 225,699,266,255,483,683,903,6
79,631,531,149,297,180,538,778,7297
310 DATA 300,8,921,1229
```

●

### Listing 2.
### Assembly listing.

```
; TRANSLATOR FOR ATARI 800XL
; by A. GIAMBRA
;
; THIS PROGRAM READS THE
; OS FROM THE 800 COMPUTER
; AND WRITES IT TO DISK
;
; EQUATES
;
ICCMD      =    $0342    ;I/O COMMAND
ICBAL      =    $0344    ;BUFFER ADDRESS
ICBLL      =    $0348    ;BUFFER LENGTH
BUFF       =    $3100    ;BUFFER
CIOV       =    $E456    ;OS I/O ROUTINE
PUTC       =    $0B      ;PUT CHARACTERS
;
           *=   $3000
           PLA           ;PULL BYTE OFF STACK
INITY      LDY #$00      ;INIT REGISTERS
           LDX #$00
FILLBUF    LDA $D800,Y ;GET THE ATARI OS
           STA BUFF,X  ;AND PUT IN BUFFER
           INX
           INY
           BPL FILLBUF ;DO 128 BYTES
           JSR WRITEBUF ;WRITE IT
           LDX #$00
AGAIN      LDA $D800,Y ;GET NEXT
           STA BUFF,X  ;128 BYTES
           INX
           INY
           BNE AGAIN
           JSR WRITEBUF ;WRITE IT
           INC FILLBUF+2 ;INC ADDRESSES
           INC AGAIN+2
           BNE INITY     ;DO MORE
           RTS
;
WRITEBUF LDX #$10       ;CHANNEL 1
           LDA #PUTC     ;PUT COMMAND
           STA ICCMD,X
           LDA # <BUFF ;STORE BUFF ADDRESS
           STA ICBAL,X
           LDA # >BUFF
           STA ICBAL+1,X ;STORE BUFF LENGTH
           LDA #$80
           STA ICBLL,X
           LDA #0
           STA ICBLL+1,X
           TYA           ;SAVE THE Y REGISTER
           PHA
           JSR CIOV      ;DO I/O
           PLA
           TAY           ;RESTORE Y
           RTS
```

---

```
           .OPT NO LIST
; TRANSLATOR FOR ATARI 800XL
; by A. GIAMBRA
;
; INSTALL TRANSLATOR
;
; EQUATES
;
HATABS     =    $031A
ICCMD      =    $0342    ;I/O COMMAND
ICBAL      =    $0344    ;BUFFER ADDRESS
ICBLL      =    $0348
ICAX1      =    $034A
CIOV       =    $E456    ;OS I/O ROUTINE
RESET      =    $E477    ;OS RESET ROUTINE
PUTC       =    $0B      ;PUT CHARACTERS
CONSOL     =    $D01F    ;START BUTTON
PORTB      =    $D301    ;ROM SELECT
NMIEN      =    $D40E    ;NMI REGISTER
IRQEN      =    $D20E    ;IRQ REGISTER
INHIB      =    $02F0    ;CURSOR INHIBIT
CR         =    $9B
DOWN       =    $1D      ;DOWN ARROW
TAB        =    $7F
CLEAR      =    $7D
;
           *=   $3000
;
           LDA #$0C      ;CLOSE EDITOR
           STA ICCMD
           LDX #0
           JSR CIOV
;
;RESET DEVICE HANDLER TABLE
;(NECESSARY FOR ATARIWRITER)
;
           LDY #14
DTRESET    LDA DTBL,Y
           STA HATABS,Y
           DEY
           BPL DTRESET
;
           LDA # <EDITOR ;OPEN EDITOR
           STA ICBAL
           LDA # >EDITOR
           STA ICBAL+1
           LDA #$03
           STA ICCMD
           LDA #$0C
           STA ICAX1
```

# Translator *continued*

```
          JSR CIOV
          LDA #PUTC
          STA ICCMD     ;PUT CHARACTERS
          LDA # <MSG    ;STORE MESSAGE
          STA ICBAL     ;ADDRESS
          LDA # >MSG
          STA ICBAL+1
          LDA # <MSG1-MSG
          STA ICBLL     ;STORE LENGTH
          LDA # >MSG1-MSG
          STA ICBLL+1
          LDA #1        ;INHIBIT CURSOR
          STA INHIB
          JSR CIOV      ;WRITE MESSAGE
          LDA PORTB
          AND #$02
          BNE WAIT
          LDA # <MSG1 ;STORE MESSAGE
          STA ICBAL     ;ADDRESS
          LDA # >MSG1
          STA ICBAL+1
          LDA # <END-MSG1
          STA ICBLL     ;STORE LENGTH
          LDA # >END-MSG1
          STA ICBLL+1
          JSR CIOV      ;WRITE MESSAGE
WAIT      LDA CONSOL    ;SELECT PRESSED?
          CMP #5
          BNE WAIT      ;NOT YET
          LDA #0
          STA NMIEN     ;SHUT OFF NMI
          STA IRQEN     ;SHUT OFF IRQ
          LDA PORTB
          AND #$FE      ;DESELECT OS ROM
          STA PORTB
INITY     LDY #0
MOVEIT    LDA $3800,Y ;MOVE OLD OS
          STA $D800,Y ;INTO RAM
          INY
          BNE MOVEIT
          INC MOVEIT+2 ;INC ADDRESSES
          INC MOVEIT+5
          BNE INITY
          JMP RESET     ;GO TO COLD START
;
MSG       .BYTE CLEAR,DOWN,DOWN,DOWN
          .BYTE TAB,TAB,"PRESS SELECT",CR
MSG1      .BYTE DOWN,DOWN,TAB
          .BYTE "       (CARTRIDGE PRESENT)"
END
EDITOR    .BYTE "E:",$9B
DTBL      .BYTE $50,$30,$E4 ;P:
          .BYTE $43,$40,$E4 ;C:
          .BYTE $45,$00,$E4 ;E:
          .BYTE $53,$10,$E4 ;S:
          .BYTE $4B,$20,$E4 ;K:
          .END
```

---

```
; PATCHES TO 800 OS
;
; 800 OS IS FIRST LOADED INTO RAM
; AT $3800 THRU $5FFF THESE PATCHES
; ARE THEN LOADED OVER THE CODE, AND
; IT IT THEN MOVED UP INTO RAM
; BEGINNING AT $D800
;
; by A. GIAMBRA
;
          *=  $46E7
          NOP              ;DON'T TOUCH $D301
          NOP
          NOP
;
          *=  $48BE        ;INTERCEPT VB
          JMP $FCD8
;
          *=  $512E        ;CHANGE ENTRY POINT FOR
          JSR $F244        ;SPECIAL ROUTINE
;
          *=  $523F
          CMP #$D0         ;TOP OF RAM?
          BNE $525F
          RTS              ;YES, RETURN
;
          *=  $5267
          BNE $5243
;
          *=  $5274
          JMP $F23F        ;CHECK FOR RAMTOP
;
          *=  $590A
          RTS              ;DISABLE BELL ROUTINE
;
          *=  $56FB
          NOP              ;NO KEYCLICK
          NOP
          NOP
;
          *=  $5EC3
          .BYTE $90        ;NEW BACKGROUND COLOR
;
          *=  $5CD8
          LDA $D01F        ;DO THEY WANT
          BEQ RESET        ;SYSTEM RESET?
          JMP ($0224)
RESET     JMP $E477
;
          *=  $5283
          NOP              ;DON'T TOUCH $D301
          NOP
          NOP
          .END
```


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by Sol Guber

Structured programming is a way of thinking. It divides the parts of a program into smaller and smaller parts, and then, when the parts are very tiny (and obvious), starts to write the program. This kind of thinking is the basis of any FORTH program, first the top-down, then the bottom-up. First, look at the big picture, then keep looking at the littler and littler picture. Finally, from the details, build up the big picture again. Action! uses the same thinking to make up programs.

### The game.

**Color the Shapes** is a game which was written using a top-down, then bottom-up type of programming.

First, let's go over the game briefly. It's a competitive coloring game for either one or two persons. The object in the one-player game is to color in all the shapes on the board with any of the four colors that are shown on the bottom of the screen.

The only rule is that shapes with a side in common cannot have the same color. If all they have is a corner in common, then they may share a color. If you try to fill in a spot with a color that cannot be used there, you'll hear a double beep, and a message will be shown on the screen.

To make the game more fun, there's an option for the computer to fill up to five shapes at random with a random color. The object of the two-person game is to be the last person to color a shape. That person is the winner.

Since there's no way for the computer to determine if there are any more legal moves, I've included an option to quit. This is done by moving the cursor to the Q on the bottom of the screen.

Figure 1 shows a sample board that will need to be colored in. Each time the game is played, a new board will be generated. The letters in the various shapes are used later in the description of the data structures.

Figure 2 shows a game in progress. The bottom

# Color the Shapes *continued*

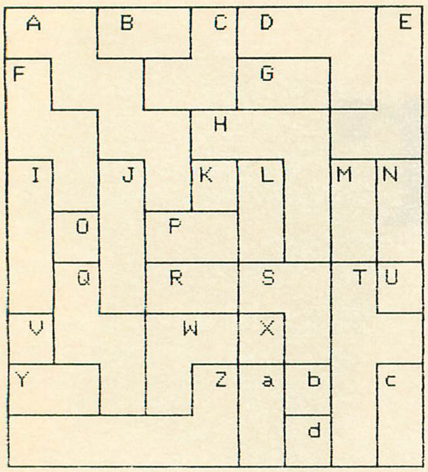



Figure 1.

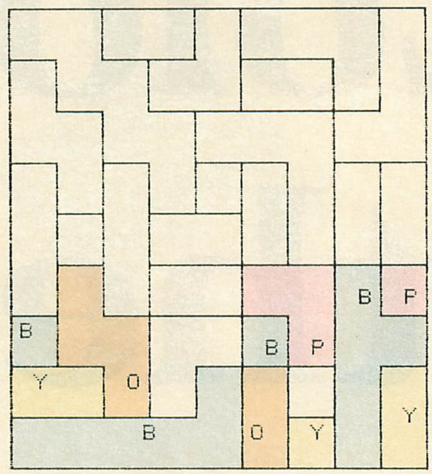



Figure 2.

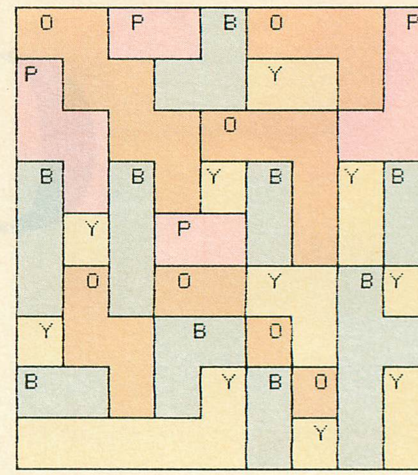



Figure 3.

of the board has been filled in with various colors. Figure 3 shows a completed game.

The cursor is a star that is shown on the screen. **Color the Shapes** can be played with either a **KoalaPad** or a joystick. A question will be asked after the entering of the players' names, to determine if this will be the joystick version.

In the **KoalaPad** version, the cursor is moved by pointing to the spot where you wish to move. The cursor will go there. In the joystick version, move the joystick in the direction that you wish to go, and the cursor will head that way.

The cursor's color is the same as the color that will be used to fill the shape. When the cursor is anywhere in the shape that you wish to fill, just press the trigger.

To change colors for the fill, move the cursor to any colored shape and press the trigger. This will give a beep, and the cursor will move to the bottom of the screen. By moving the cursor left or right, you move to the position of one of the other colors, or the Q. Press the trigger when the cursor is by the color you want. You can change colors as many times as you want.

Your turn will be over when you successfully fill in a shape. There's no way to lose a turn.

### The structure.

Now that we know the basic outline of the game, what does this have to do with structured programming? That's easy to see by looking at the last PROC that was written.

It's just a long loop that does very logical things. It's made up of TITLE, PMGRAPHICS, SETUP, PMCLEAR, MAKEPM, GRID, SEARCH, CHECK_BOARD, INIT, NAME and, finally, the major DO OD loop. This loop just consists of two lines and a limit.

The first part of the PROC sets everything up and checks to see what's been done. The heart of the program can be explained very simply by the two functions TRIGGER and JOYSTICK.

TRIGGER checks to see if the trigger has been pressed. JOYSTICK checks to see if a move's been made. IF TRIGGER = 0 then COLOR_IN(SPOT). IF JOYSTICK = 1 then MOVE(). Do this until either the board is completed or QUIT = 1. How could any program be simpler?

This is the whole point of structuring programs: break everything down into easy-to-digest units that are logically simple. While the game's going on, the only two things to look at are the triggers and either the joystick or the **KoalaPad**.

How long should the program monitor these two things? Until the game is complete, or someone quits. Then what? Ask if another game is desired. If it is, play again; otherwise, finish. There's no need to monitor the keyboard, get data from the disk, or do anything else.

Structured programming uses the concepts of positive actions. Do an action until something happens or a flag is set or while a condition still occurs. It can be used in all parts of the program to make the programming easier and very logical. Let me go into some more details on how this type of thinking; the idea to *do* while or *until* is a very nice concept.

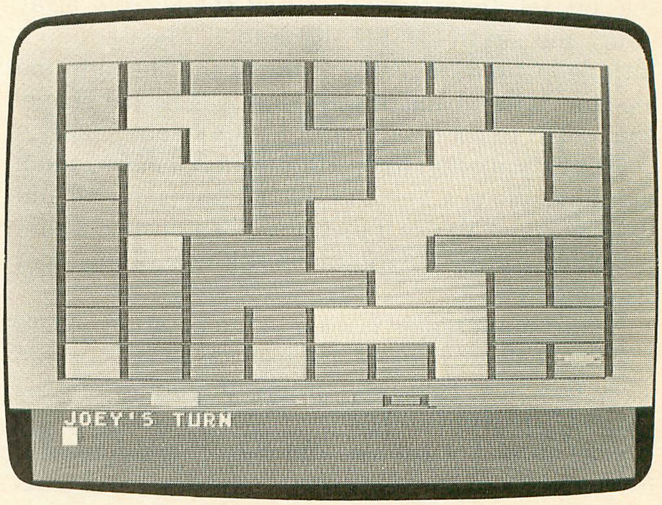
This simplicity is used in other parts of the program. Let us go through several of the other procedures and functions. If the trigger has been pressed, TRIGGER() = 0 and we will C = COLOR_IN(SPOT). There are several options in that procedure. If the spot has a color there, B(SPOT) < > 0, then what we want to do is change colors or quit. A loop is set up so that we continue to PICK_COLOR until a flag is returned to say that it is non-zero. A good pick has been done. If quit is one, then return. Otherwise move the cursor back to where it was and continue the turn. If the spot had not been colored in already, then we must check to see if it is a GOOD_COLOR. If the flag is returned as 0 then BEEP, print a message on the screen, BEEP again, and then RETURN. Finally, if it is a good move, then FILL_IN(SPOT), check to see if there are two players, and write the new name on the screen.

JOYSTICK is another example of a simple procedure that does only one thing; it checks to see if there has been any movement in the joystick or the **KoalaPad**. CFLAG is used to signal that the **KoalaPad** is to be used. If it's on, check the two locations in memory that store the value of the point on the pad that's being touched. If either point is less than five, then the pad is not being touched. RETURN a zero to show no movement. Next, calculate the X and Y position of the point that's being touched. If the movement is only slight, then RETURN a zero to again show no good movement. Otherwise, set the new X and Y positions to this point, and return a 1 to show success.

The other part of JOYSTICK() is used if play is with a joystick. First determine the value of the joystick. If it is 15, RETURN a zero to show no move. If the value is 11 and you can move left, then move left and return a 1 for success. If it is 7 and you can move right, then make the new position and return a success. Do this for up and down. If no move was possible, return a zero for unsuccessful move.

Both of these two procedures show how the logic was broken up into simple steps, each one of which was very obvious. There were other parts of the program that took judgement and thinking. They're not really a part of structured programming, but are necessary, anyway.

There's a lot of data stored about the screen. See Figure 1 for an example of an initial board. It's a nine-by-nine grid and can have many shapes in it.




**Color the Shapes.**

There are four data structures that were used to store information about the shapes. The first was an array called R. It is a simple one-to-one correspondence to the grid on the screen. The first value corresponds to the top square; the one below is R(11); and so forth.

To make some of the calculating easier, the array for R was made up to be ten squares by nine rows. R is filled with numbers corresponding to the shapes that are seen. Thus, the first shape (Figure 1) will put R(1) = 1, R(2) = 1, R(12) = 1, R(13) = 1, R(23) = 1, etc.

The array B is a simple correspondence to array A. It just contains the color values of each square in the grid. The next array is GAR. Shape A corresponds to GAR(1), shape B corresponds to GAR(2), etc. The values in GAR tell how big the shapes are. The value is a two-digit number. The units digit is the row for the top of the shape, and the tens digit is the row for the bottom of the shape.

Thus, shape G is GAR(7) and has a value of 11. Shape M is GAR(13) and has a value of 43, and shape A gives GAR(1) = 30. The final array is called USED. It corresponds to GAR and tells if each shape has been colored in. Every time a shape is filled with color, the corresponding shape in USED is given a

1. Thus the function COMPLETE, to determine if the game is over, just looks at each value in USED, and if there's a 1 in each spot, then all the shapes have been colored in.

Now that we have some information on how the data is stored, we can look at some of the other functions and see how simple they are to program.

Let's look at FILL_IN. First, we determine the number of the shape where we are from array R. Find the top and bottom rows of that shape from array GAR, and set the USED shape to 1. Then set up a little loop from the bottom row of the shape to the top row of the shape. If the value in R is that shape, then set B to that color, and FILLER that square.

FILLER's another little subroutine. Check to see if the right side is a line and the bottom is a line. You should change values if they are. Then, just do a simple PLOT, DRAWTO routine to fill in with the color selected.

A very similar logic is used in the function GOOD_COLOR. First, determine the shape you're on from array R. Then, find the top and the bottom of the shape from array GAR.

Start at the bottom row and check each square. If it's part of the same shape as the one that we're looking at, check all four squares around it to see if the color is present there. If it is, return a 0 to show failure. If everything's been checked, and no two colors will be touching, report a success (RETURN(1)).

Among the things that I haven't done is explain how some of the data is generated, or how the random shapes are made, but the logic in this part is also very straightforward and can be explored, if needed.

This game is a good example of two things. The first is that Action! makes structured programming very easy. The second is that, with good simple logic on the overall design of a program, it can be split into smaller and smaller parts. Each part can be further divided into parts that are easily programmed.

I hope you enjoy **Color the Shapes**. My daughter and I had fun inventing it. It's a good game of logic from which you can learn about programming. □

---

*Sol Guber has been programming for his Atari 800 for five years now. The idea for this game came from his seven-year-old daughter Rebecca, to whom computers are a natural part of life.*

---

**Listing 1.**
**Action! listing.**

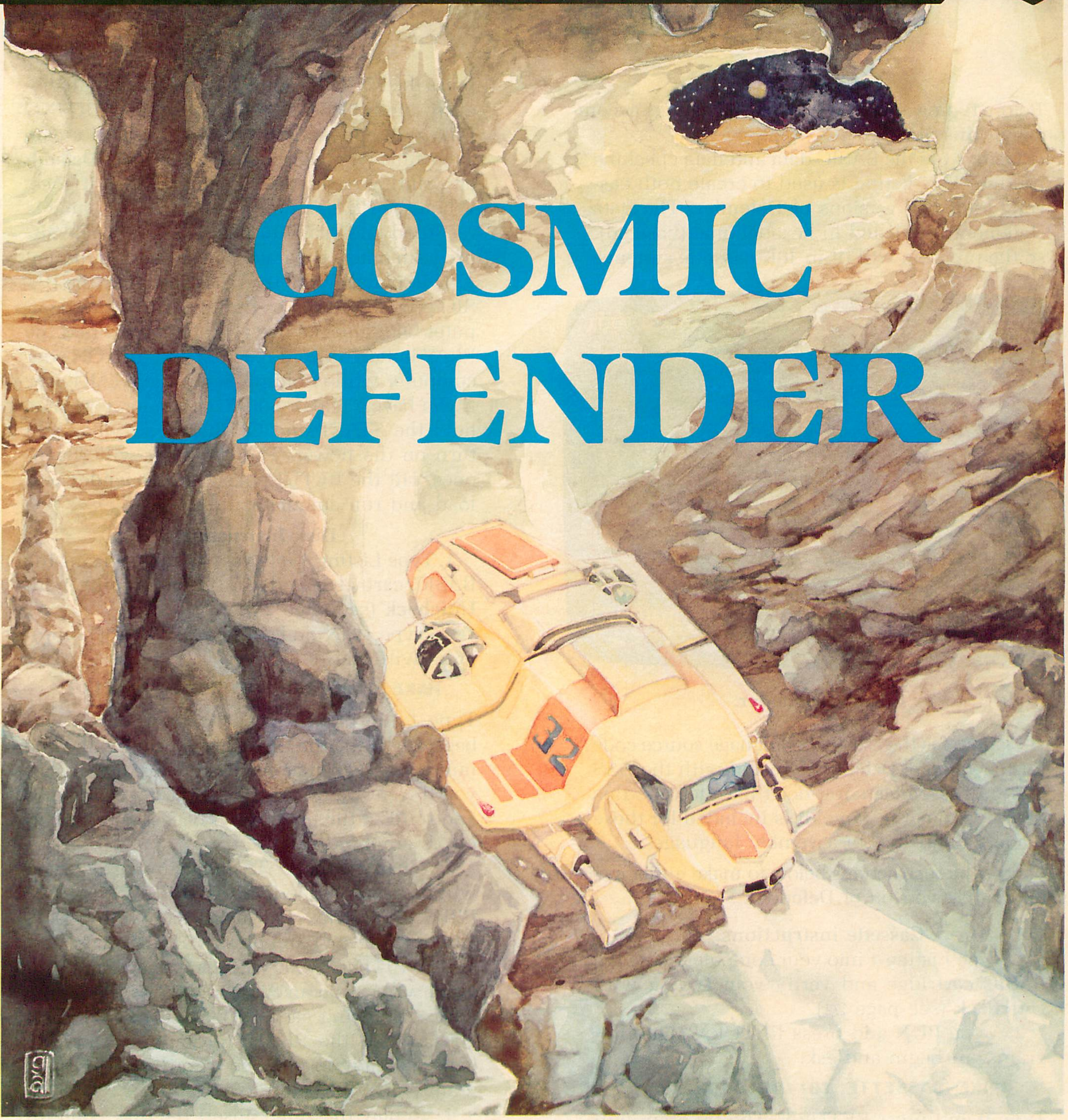
```
; COLOR THE SHAPES
;
; by Rebecca Guber and Sol Guber

MODULE

BYTE ARRAY
  R(100),USED(60),PLAYER(20),B(90),
  CLS=704,A(10),GAR(60),
  INTER=[72 169 0 141 10 212 141 27
        208 104 64],
  TX=[0 252 0 4],TY=[248 0 8 0],
  TEST=[246 255 10 1],
  COLORS=[8 122 88 28 132 248 190
        14 190],
  STAR=[0 0 0 0 24 126 60 60 126 24
       0 0 0 0]

CARD SC1,YP1,YP,Y1
BYTE CFLAG,COL,PLAYNUM,COUNT,DX,DY,
     OLDX,OLDY,X,Y,TURN,QUIT

PROC SETUP()
CARD Z
Z=PEEKC(560)
POKE(Z+166,143)
POKEC(512,INTER)
POKE(54286,192)
POKE(87,10)
POKE(623,160)
FOR Z=0 TO 8 DO
  CLS(Z)=PEEK(COLORS+Z)
OD
RETURN

PROC BLOCK(BYTE I)
BYTE J
FOR J=152 TO 157 DO
  PLOT (I,J)
  DRAWTO(I+5,J)
OD
RETURN

PROC NEWDIR(BYTE A,B)
DX=0
DY=0
IF LOCATE(A+1,B)>0 THEN
  DX=1
ELSEIF LOCATE(A-1,B)>0 THEN
  DX=-1
ELSEIF LOCATE(A,B-1)>0 THEN
  DY=-1
ELSE
  DY=1
FI
RETURN

BYTE FUNC LINE(BYTE A,B)
BYTE Z,J
Z=LOCATE(A+1,B)
J=LOCATE(A-1,B)
Z==+J
J=LOCATE(A,B+1)
Z==+J
J=LOCATE(A,B-1)
Z==+J
IF Z>6 THEN
  RETURN(Z)
FI
NEWDIR(A,B)
RETURN(1)

PROC REMOVE(BYTE A,B)
DO
```

```
   PLOT(A,B)
   A==+DX
   B==+DY
   UNTIL LINE(A,B)<>1
OD
RETURN

PROC GRID()
BYTE I,X,Y,Z,XOLD,YOLD,Y1
COLOR=6
I=2
WHILE I<157 DO
   PLOT(3,I)
   DRAWTO(74,I)
   I==+16
OD
I=3
WHILE I<79 DO
   PLOT(I,2)
   DRAWTO(I,145)
   I==+8
OD
FOR I=2 TO 5 DO
   COLOR=I
   BLOCK((I-2)*10+5)
OD
COLOR=6
PLOT(45,153)
DRAWTO(50,153)
DRAWTO(50,157)
DRAWTO(45,157)
DRAWTO(45,153)
PLOT(51,158)
COLOR=0
FOR I=1 TO 40 DO
   DO
      X=RAND(8)*8+7
      Y=RAND(16)*8+10
      Y1=Y-10
      IF Y1/8=(Y1/16)*2 THEN
         X==+4
      FI
      UNTIL LOCATE(X,Y)<>0
   OD
   XOLD=X
   YOLD=Y
   IF Y1/8=(Y1/16)*2 THEN
      DX=0
      DY=-1
      REMOVE(X,Y)
      DX=0
      DY=1
      REMOVE(XOLD,YOLD)
   ELSE
      DY=0
      DX=-1
      REMOVE(X,Y)
      DY=0
      DX=1
      REMOVE(XOLD,YOLD)
   FI
OD
RETURN

PROC TITLE()
BYTE X,Y,C,K1,K2
CARD SC,J
SC1=PEEKC(88)
GRAPHICS(19)
SC=PEEKC(560)
FOR J=7 TO 9 DO
   POKE(SC+J,7)
OD
POKE(87,2)
COLOR=0
PLOT(0,1)
PRINTDE(6,"COLOR THE SHAPES")
PRINTDE(6," by rebecca guber")
PRINTDE(6," AND SOL GUBER")
POKE(87,3)
FOR J=1 TO 1000 DO
   FOR K2=1 TO 500 DO
   OD
   X=RAND(39)
   Y=RAND(12)+8
   C=RAND(255)
   SOUND(0,C,8,8)
   COLOR=RAND(4)
   PLOT(X,Y)
OD
SOUND(0,0,0,0)
RETURN

BYTE FUNC NEWSPOT(BYTE J,COUNT)
BYTE K,Y1,X1,Z,K1
R(J)==+128
Y1=((J-1)/10)*16+10
X1=((J-1) MOD 10)*8+7
FOR K=0 TO 3 DO
   Z=LOCATE(X1+TX(K),Y1+TY(K))
   K1=J+TEST(K)
   IF Z=0 AND R(K1)=0 THEN
      R(K1)=COUNT
      RETURN(K1)
   FI
OD
RETURN(0)

BYTE FUNC OLDSPOT(BYTE J,COUNT)
BYTE K,K1
R(J)==-128
K=3
WHILE K<>255 DO
   K1=J+TEST(K)
   IF K1>0 AND K1<100 THEN
      IF R(K1)>128 THEN
         R(K1)==-128
         RETURN(K1)
      FI
   FI
   K==-1
OD
RETURN(0)

PROC FIND(BYTE J,COUNT)
BYTE K,K1
R(J)=COUNT
DO
   K=NEWSPOT(J,COUNT)
   IF K=0 THEN
      K1=OLDSPOT(J,COUNT)
      J=K1
   ELSE
      J=K
   FI
   UNTIL J=0
OD
RETURN

PROC SEARCH()
BYTE J,COUNT,K,K1
ZERO(R,100)
COUNT=1
FOR J=1 TO 89 DO
   IF R(J)=0 AND J MOD 10<>0 THEN
      FIND(J,COUNT)
      COUNT==+1
   FI
OD
FOR J=1 TO 89 DO
   IF R(J)>128 THEN
      R(J)==-128
   FI
OD
RETURN
```

```
; PMG.ACT FROM THE ACTION! TOOLKIT

INCLUDE "D1:PMG.ACT"


BYTE FUNC SIZE(BYTE K)
BYTE J
FOR J=K+1 TO K+9 DO
  IF R(J)=COUNT THEN
    RETURN(1)
  FI
OD
RETURN(0)


PROC CHECK_BOARD()
BYTE J,K
COUNT=1
FOR J=1 TO 99 DO
  IF J MOD 10 <>0 THEN
    WHILE R(J)<COUNT AND J<100 DO
      J==+1
    OD
    GAR(COUNT)=J/10
    K=(J/10)*10+10
    WHILE SIZE(K)=1 DO
      K==+10
    OD
    GAR(COUNT)==+(K-10)
    COUNT==+1
  FI
OD
COUNT==-1
RETURN

PROC SHIFT(BYTE X1)
BYTE Z,Z1
IF X1=140 THEN
  QUIT=1
  RETURN
FI
Z=(X1-60)/20+1
COL=Z+1
Z1=PEEK(705+Z)-6
POKE(705,Z1)
RETURN

PROC BEEP()
CARD Q
SOUND(0,220,10,10)
FOR Q=1 TO 25000 DO
OD
SOUND(0,0,0,0)
RETURN

BYTE FUNC PICK_COLOR()
BYTE S,TR,J,X1
CARD I1
FOR I1=OLDY TO 173 DO
  PMMOVE(1,X,I1)
OD
OLDY=173
PRINTE("PLEASE PICK A COLOR")
X1=60
PMHPOS(1)=60
IF CFLAG=1 THEN
  DO
    J=PEEK(624)
    IF J>5 THEN
      J=(J/50)*20+60
      PMHPOS(1)=J
    FI
    IF PEEK(636)=0 OR
       PEEK(637)=0 THEN
      BEEP()
      SHIFT(J)
      RETURN(1)
    FI
  OD
FI
DO
  DO
    S=STICK(0)
    TR=STRIG(0)
    IF TR=0 THEN
      BEEP()
      SHIFT(X1)
      RETURN(1)
    FI
    UNTIL S<>15
  OD
  IF S=7 THEN
    X1==+20
    IF X1=160 THEN
      X1=60
    FI
  FI
  IF S=11 THEN
    X1==-20
    IF X1=40 THEN
      X1=140
    FI
  FI
  PMHPOS(1)=X1
  FOR I1=1 TO 6000 DO
  OD
OD
RETURN(1)

BYTE FUNC GOOD_COLOR(BYTE SPOT,COL)
BYTE TOP,BOT,BLOCK,I
BLOCK=R(SPOT)
TOP=GAR(BLOCK)
BOT=(TOP MOD 10)*10
TOP=(TOP/10)*10
WHILE BOT<TOP+9 DO
  IF R(BOT)=BLOCK THEN
    FOR I=0 TO 3 DO
      IF B(BOT+TEST(I))=COL THEN
        RETURN(0)
      FI
    OD
  FI
  BOT==+1
OD
RETURN(1)

PROC FILLER(BYTE J)
BYTE X,Y,K,L,L1
L1=6
IF R(J)=R(J+1) THEN
  L1==+1
FI
L=14
IF R(J)=R(J+10) THEN
  L==+1
FI
X=(J/10)*16+3
Y=(J MOD 10)*8-4
FOR K=X TO X+L DO
  PLOT(Y,K)
  DRAWTO(Y+L1,K)
OD
RETURN

PROC FILL_IN(BYTE SPOT)
BYTE N,TOP,BOT,J
N=R(SPOT)
TOP=GAR(N)
BOT=TOP MOD 10
TOP=(TOP/10)*10
USED(N)=1
```

*(Action! listing continues on page 88)*

# COSMIC DEFENDER



**by Phill Roey**

For thousands of years, the evil Lyrean race has ruled the galaxy. As soon as another race reaches technological levels advanced enough to achieve star travel, the Lyreans' ultimate weapon—the Mesotron Cannon—is trained on them.

Now, mankind's turn has come. The cannon is inside Pluto's orbit and approaching rapidly, gathering asteroids to use as fuel as it comes. Things couldn't look more desperate.

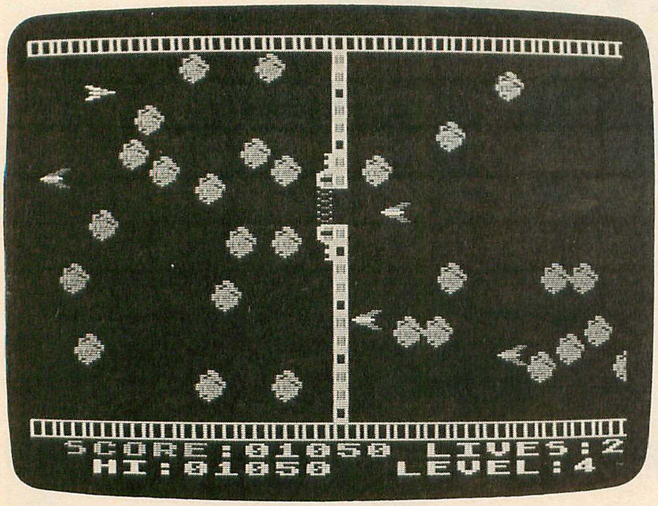
Yet all is not lost. While on a routine maintenance stop on asteroid A37THETA, your ship is swallowed by the cannon. Your duty is clear. You must blast the asteroids which the cannon uses as fuel, and fire through force fields that grow ever closer. You must render this huge weapon inoperative.

*(continued on next page)*

### Typing it in.

Before typing anything, look at the listings accompanying this article.

**Listing 1** is the BASIC data and data checking routine. This listing is used to create both cassette and disk versions of **Defender**. The data statements are listed in hexadecimal (base 16), so the program will fit in 16K cassette systems.




Cosmic Defender.

**Listing 2** is the assembly language source code for the game of **Defender**, created with the OSS MAC/65 assembler. You *don't* have to type this listing to play the game! It is included for those readers interested in assembly language.

Follow the instructions below to make either a cassette or disk version of **Defender**.

### Cassette instructions.

1. Type Listing 1 into your computer using the BASIC cartridge and verify your typing with **Unicheck** (see page 24).

2. Type *RUN* and press RETURN. The program will begin and ask:

```
MAKE CASSETTE (0) OR DISK (1)?
```

Type *0* and press RETURN. The program will begin checking the DATA statements, printing the line number of each as it goes. It will alert you if it finds any problems. Fix any incorrect lines and re-RUN the program, if necessary, until all errors are eliminated.

3. When all of your DATA lines are correct, the computer will beep twice and prompt you to *READY CASSETTE AND PRESS RETURN*. Now, insert a blank cassette in your recorder, press the RECORD and PLAY buttons simultaneously and hit RETURN. The message *WRITING FILE* will appear, and the program will create a machine language boot tape version of **Defender**, printing each DATA line number as it goes. When the *READY* prompt appears, the game is recorded and ready to play. CSAVE the BASIC program onto a separate tape before continuing.

4. To play, rewind the tape created by the BASIC program to the beginning. Turn your computer OFF and remove all cartridges. Press the PLAY button on your recorder and turn ON your computer while holding down the START key. If you have a 600 or 800XL computer, you must hold the START and OPTION keys when you turn on the power. The computer will "beep" once. Hit the RETURN key, and **Defender** will load and run automatically.

### Disk instructions.

1. Type Listing 1 into your computer, using the BASIC cartridge and verify your typing with **Unicheck** (see page 24).

2. Type *RUN* and press RETURN. The program will ask:

```
MAKE CASSETTE (0) OR DISK (1)?
```

Type *1* and press RETURN. The program will begin checking the DATA lines, printing the line number of each statement as it goes. It will alert you if it finds any problems. Fix incorrect lines and re-RUN the program, if necessary, until all errors are eliminated.

3. When all the DATA lines are correct, you will be prompted to *INSERT DISK WITH DOS, PRESS RETURN*. Put a disk containing DOS 2.0S into drive #1 and press RETURN. The message *WRITING FILE* will appear, and the program will create an AUTORUN.SYS file on the disk, displaying each DATA line number as it goes. When the READY prompt appears, the game is ready to play. Be sure the BASIC program is SAVEd before continuing.

4. To play the game, insert the disk containing the AUTORUN.SYS file into drive #1. Turn your computer OFF, remove all cartridges and turn the computer back ON. **Defender** will load and run automatically.

### Playing the game.

**Defender** is a one-player game that requires a joystick in port 1. Choose the level (1 to 9) you wish to begin on, by pressing the SELECT key.

You start the play by either pressing the START key or the trigger on the joystick. Hitting the SPACE BAR will pause the game; hitting it a second time will resume the game. **Defender** can be aborted at any time by pressing the OPTION key.

Defend your species with all the cunning at your command. Be careful; I think the Lyreans know you're coming. □

---

*Phill Roey lives in Atlanta and works for UPS. He became a computer enthusiast after seeing a game of **Lunar Lander** played on an old Selectric terminal. He's had his Atari 800 since 1982, and this is his first assembly language game.*

---

**Listing 1.**
**BASIC listing.**

```
10 REM *** COSMIC DEFENDER ***
20 TRAP 20:? "MAKE CASSETTE (0), OR DI
SK (1)";:INPUT DSK:IF DSK>1 THEN 20
30 TRAP 40000:DATA 0,1,2,3,4,5,6,7,8,9
,0,0,0,0,0,0,0,10,11,12,13,14,15
40 DIM DAT$(91),HEX(22):FOR X=0 TO 22:
READ N:HEX(X)=N:NEXT X:LINE=990:RESTOR
E 1000:TRAP 120:? "CHECKING DATA"
50 LINE=LINE+10:? "LINE:";LINE:READ DA
T$:IF LEN(DAT$)<>90 THEN 220
60 DATLIN=PEEK(183)+PEEK(184)*256:IF D
ATLIN<>LINE THEN ? "LINE ";LINE;" MISS
ING!":END
70 FOR X=1 TO 89 STEP 2:D1=ASC(DAT$(X,
X))-48:D2=ASC(DAT$(X+1,X+1))-48:BYTE=H
EX(D1)*16+HEX(D2)
80 IF PASS=2 THEN PUT #1,BYTE:NEXT X:R
EAD CHKSUM:GOTO 50
90 TOTAL=TOTAL+BYTE:IF TOTAL>999 THEN
TOTAL=TOTAL-1000
100 NEXT X:READ CHKSUM:IF TOTAL=CHKSUM
 THEN 50
110 GOTO 220
120 IF PEEK(195)<>6 THEN 220
130 IF PASS=0 THEN 170
140 IF  NOT DSK THEN 160
150 PUT #1,224:PUT #1,2:PUT #1,225:PUT
 #1,2:PUT #1,0:PUT #1,32:CLOSE #1:END
160 FOR X=1 TO 3:PUT #1,0:NEXT X:CLOSE
 #1:END
170 IF  NOT DSK THEN 200
180 ? "INSERT DISK WITH DOS, PRESS RET
URN";:DIM IN$(1):INPUT IN$:OPEN #1,8,0
,"D:AUTORUN.SYS"
190 PUT #1,255:PUT #1,255:PUT #1,0:PUT
 #1,32:PUT #1,212:PUT #1,44:GOTO 210
200 ? "READY CASSETTE AND PRESS RETURN
";:OPEN #1,8,128,"C:":RESTORE 230:FOR
X=1 TO 40:READ N:PUT #1,N:NEXT X
210 ? :? "WRITING FILE":PASS=2:LINE=99
0:RESTORE 1000:TRAP 120:GOTO 50
220 ? "BAD DATA: LINE ";LINE:END
230 DATA 0,26,216,31,255,31,169,0,141,
47,2,169,60,141,2,211,169,0,141,231,2,
133,14,169,56,141,232,2
240 DATA 133,15,169,0,133,10,169,32,13
3,11,24,96
1000 DATA D8A085A222A907205CE4A93E8D2F
02A9038D1DD0A9228D6F02A9058D0CD0A9648D
C402A9268DC502A9388DC602,917
1010 DATA A9D48DC702A9008DC802A9AA8DC0
02A9368DC102A9008D07D4A000B900E0990008
99000C990010B900E1990009,550
1020 DATA 99000D99001188D0E5A077B96228
990808B9DA2B99080CB9522C9908108810EBA9
088DF40220752120A320205C,824
1030 DATA 21208B21203F2920D12520B62020
F727203A21AD1FD0C903D0F6F0DC2065E4A900
8590A00078D08D29900D28810,540
1040 DATA FA60AD182B38E911A8A90085D6B9
31218591AAAD0AD2C9FAB0F9A8AD0AD2293EC9
28B0F7690120FC20D0E8A691,601
1050 DATA AD0AD2C93090F9C9FFF0F5A8AD0A
D2293EC928B0F720FC20D0E66018693085D7B1
D6C811D6E6D7E6D711D68811,376
1060 DATA D6D01FC6D7C6D7A90191D6A902C8
91D6E6D7E6D7A90491D6A9038891D6A93085D7
CA60283C46647D4664564AD,784
1070 DATA 00D0F0028581AD08D029FCF00285
82AD04D0D007AD0CD029FDF00585808D1ED060
A95A85D7A20086D6A0008A91,511
1080 DATA D6C8D0FAC6D7A92FC5D7D0F260A9
00A8990003990004990005990006990007C8D0
EE60A90085858580858185 82,60
1090 DATA 8597859885 8A858B8595 8593A930
8596A9138D052B8583A9548DAF2A8D1ED0A932
8599A964859A858460A594D0,808
1100 DATA 27858785 8B8D01D0A901859420A3
20209923A96485 84A9148D08D2A9C88D06D2A9
878D05D28D07D2AD0AD22906,901
1110 DATA 8D12D08D13D0AD0AD28D00D2AD0A
D28D02D2AD0AD229DF8D01D28D03D2C684D032
20A320A93285998D1ED0A964,457
1120 DATA 859AA90085948580CE052BAD052B
C910F017A90085 95A93085968D1ED020D92320
752120F7274C62E420752120,140
1130 DATA A320A9008580A9018D1ED08583A9
198DAD2A8DB32AA92B8DAE2A8DB42AA94E8DB0
2AA92B8DB12AA9468DAF2AA9,366
1140 DATA FF8D2E028D2002AD2E02D0FB4C7F
20A90085D8A583D044854DA582F00620782820
DD28A580F0034CBF21ADFC02,489
1150 DATA C921D00BA9FF8DFC02A58549FF85
85A585D01B20912520BC2620E222200E232052
2320EA2420482820AD2320D9,115
1160 DATA 23A59EF00AA9BD8D0002A9298D01
024C62E4AD00D3A69A4AB006E020F002C69A4A
B006E0BEF002E69AA6994AB0,655
1170 DATA 06E032F002C6994AB006E064F002
E69960A6998E00D0E8E88E05D0A49AA208BD49
23990004B9000329F3990003,887
1180 DATA C8CA10EEA49AB90303090C990303
B9040309049904 03B90503090C99050360 00C0
7000730070C000A59BD021AD,525
1190 DATA 10D0D051A901859BA49AA9039904
038489A9258D01D2A93285 86A599690685 88E6
88E688A5888D04D0E686E686,271
1200 DATA A5868D00D2A9CDC588900AA581F0
19203824205C24A9008D01D2859B8581A489B9
040329FC99040360AD2A0205,960
1210 DATA 93D01FAD182B38E911A8B904248D
1C028D2A02A497881008E695D002E696A00384
97A6978E04D460A032A596C4,23
1220 DATA 96D009C693D01E204925A93048A2
14A006A59599922AC86899922A18690248C8C8
CA10ED68500303020202020202,326
1230 DATA 0101FEF92ABDF92AC91AF00588F0
0BD0F1A9109DF92A858FD0F2A58FF00C8AF009
CAA001A900858FF0D84CB025,520
1240 DATA A58938E91D4A4A29FE186D992A85
8EA5970A18658838E9274A4A18659585 8D9002
E68E60A58D85D6A58E85D78D,860
1250 DATA 1ED0A000B1D6D00AC8B1D6D005C8
B1D6F0E4C901F03CC902D005C6D64CB724C903
F006C904D009C6D6C6D7C6D7,465
1260 DATA 4CB724C90AD00BA90D91D6E6D7E6
D74CD024C909D0B3A90D91D6C6D7C6D7C6D7C6
D74CD024A90091D6E6D7E6D7,469
1270 DATA 91D6C891D6C6D7C6D791D6A203A0
05D00EA90091D6E6D7E6D791D6A202A0028581
200D24A91985904C7828A590,586
```

```
1280 DATA F02DAD2C02D028C690A5908D2C02
F01FA8B91C258D02D2AD0AD209C08D04D2B935
2509408D03D28D05D2A9028D,537
1290 DATA 1E0260F5F4F3F2F2F0F2F5E9E0EF
F0F1F2F3F4F5F4F1F5F2F3F4F5F50000010203
040505060607070808090909,797
1300 DATA 0A0A0AEE182BAD182BC91AD005A9
148D182BA9408D0ED40878205C21A900859585
9B20A320A930859620D9238D,985
1310 DATA 1ED020D12520B620A900A20A95B5
CA10FB20F727EE052B28A9C08D0ED460AD2E02
D019A9048D20028D2E02ADF4,763
1320 DATA 02C910F005186904D002A9088DF4
0260A000B9F92AD90B2BF0049014B005C8C004
D0EFA000B9F92A990B2BC8C0,804
1330 DATA 04D0F560AD182B38E911AABD6326
8591A000A930859 2BD6C2685D6A59285D7A207
A90591D6E6D7E6D7A90691D6,800
1340 DATA E6D7E6D7A90791D6E6D7E6D7CAD0
E5AD0AD2291FC914B0F7C90590F3C6D60A1865
9285D7A90891D6C6D7C6D7A9,28
1350 DATA 0991D6C6D7C6D7A98C91D6C8A900
91D6C6D7C6D791D688A98B91D6C6D7C6D7A90A
91D6C6D7C6D7A90891D6A5D6,711
1360 DATA 659185D6908EE692A592C931F086
60FF963C1E1E3C3C5A46FFC8644B323232C864
488A48A6D8E6D8B5AA8D03D0,695
1370 DATA 8D02D0B5C08D14D0B5CB8D15D0E0
0AD00AA9A08D0002A9268D010268AA684048A9
F88D16D0A9988D17D0A9268D,160
1380 DATA 19D0A9758D0002A9268D01026840
A20086D8B59FF013B5AA38F59FD004959FA9FE
95AAE8E00AD0EA60A5930D0A,864
1390 DATA D2D0F3A901AC0AD2C00FB002A902
959FAD182BC9169002F69F4CD1260000000000
0078FC780000000000000000,780
1400 DATA 0000001C3E7F6B7F5D221C000000
0000000000000007FF87F00000000000000000
0000183C7E3C5A667E3C1800,560
1410 DATA 0000000000000070F0E1C001C0E0F
07000000000000000000002C242F3D090F000000
0000000000000010387C3810,168
1420 DATA 0000000000000000000000000207
020000000000000000000070E3C00FC003C0E07
0000000000000000000000014,613
1430 DATA 00221C0000000000000000000307
3F3F3F0703000000000000000018244281C3E7
FF7E3C18000000000000000F,45
1440 DATA 000000FC0000000F000000000000
00F09090D00B09090F000000000000000000010
2844924428100000000000000,486
1450 DATA 0000000000000020000000000000
AD182BC911F049A90A8591A00FA5910A0A0A0A
186922AAB977279D0006B9F7,512
1460 DATA 269D0007CA88D0F0C691D0E0A20A
A9FE95AAA900959FCA10F5A209A90418695095
C0CA10F8A209A98818693095,291
1470 DATA CBCA10F860A58BF02BC68CD027C6
8BA58B0A0A0A0907AAA9088592A48ABD952899
0005CAC8C692D0F4A906858C,25
1480 DATA A58BD0038D01D060A207A9088592
A48A206028A589858AA5888D01D0A909858BA9
01858C600000000000000000,294
1490 DATA 8100000000000818142000000000
42818942248001244291084A24C00324521D08
082CE007341010000808781E,558
1500 DATA 10100000008381C1000000000000
1818000000A58938E91C4A4A4A4AAAA900959F
A9FE95AAF6B5B5B585918692,397
1510 DATA A8A202200D24A692A491C0089006
A90095B58591A917859 08A0A0A0A0A186931A8
A5910A0A0A0A8591090FAABD,562
1520 DATA 7727990006BDF72699000788CAE4
91D0EE8E1ED0A90085824C9923A9058D3002A9
2A8D31022075 21A9C08D0ED4,424
1530 DATA E69EADBC298D182BAD1FD0C905D0
17EE182BAD182BC91AD002A9118D182BA91E8D
20028D2E02AD182B8D7C2A20,789
1540 DATA 9125AD10D0F007AD1FD0C906D029
A9928D3002A92A8D3102A9758D0002A9268D01
02A910A00599F82A88D0FA84,691
1550 DATA 83849EAD182B8DBC2960AD2E02D0
BDF09D11488A48A20FA59D859CA59C8D0AD48D
16D018690285 9CCA10F0A20F,30
1560 DATA A59C8D0AD48D16D038E902859CCA
10F0AD2C02D00AA9018D2C028D1E02E69DA9A0
8D0002A9268D010268AA6840,742
1570 DATA 707046DE2A70F047302A473E2A70
70464C2A465B2AF0477E2A70C66C2A70707070
707046DE2A060641052A0000,672
1580 DATA 000000000232F332D29230000000
0000000024252625 2E242532808080808080 80
8080A2B98080808080808080,766
1590 DATA 80F0E8E9ECEC80F2EFE5F9808000
000073656C656374006C6576656C1A00008080
E1EEE1ECEFE780E3EFEDF0F5,582
1600 DATA F4E9EEE780807070C6DE2A540000
D40000540000D40000540000D40000540000D4
000054 0000D40000540000D4,246
1610 DATA 000054 0000D40000540000D40000
540000D40000540000D40000540000C6DE2A06
0641922A8E8E8E8E8E8E8E8E,377
1620 DATA 8E8E8E8E8E8E8E8E8E8E8E8E80F3
E3EFF2E59A1010101010006C697665731A1300
0068691A101010101000006C,638
1630 DATA 6576656C1A110000000000000000
00000000000000000000000000000000000000
000000000000000000000000,109
1640 DATA 0000000000000000000000000000
0000000027212D2500002F3625320000000000
0000010114111A1555004050,766
1650 DATA 50645445515959 1A151105010069
58545450400000FFFFD7D7D7D7FFFFFFFFC3C3
C3C3FFFFFFFFEBEBEBEBFFFF,573
1660 DATA 0F03030F0F03030F3FF5F5EAEAF5
F53F3FF5F5EAEAF5F53FC33C00C33C00C33C00
C33C00C33C00C33FF0F0C0C0,190
1670 DATA F0F03FFF494949494949FF001E21
2D292D211E00010114111A1555004050506454
455159591A15110501006958,108
1680 DATA 545450400000FFFFEBEBEBEBFFFF
FFFFD7D7D7D7FFFFFFFFC3C3C3C3FFFF0F0303
0F0F03030F3FF5F5C0C0F5F5,559
1690 DATA 3F3FF5F5C0C0F5F53F00C33C00C3
3C00C33C00C33C00C33C003FF0F0C0C0F0F03F
FF929292929292FF001E212D,351
1700 DATA 292D211E00010114111A15550040
50506454455159591A15110501006958545450
400000FFFFC3C3C3C3FFFFFF,37
1710 DATA FFEBEBEBEBFFFFFFFFFFD7D7D7FF
FF0F03030F0F03030F3FF5F5D5D5F5F53F3FF5
F5D5D5F5F53F3C00C33C00C3,268
1720 DATA 3C00C33C00C33C00C33C3FF0F0C0
C0F0F03FFF242424242424FF001E212D292D21
1E0000000000000000000000,546
```

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CHECKSUM DATA.

(see page 24)

```
10 DATA 895,351,496,811,423,729,200,60
3,555,573,694,613,29,205,214,7391
160 DATA 128,198,962,621,491,30,155,11
0,169,951,674,575,612,65,191,5932
1060 DATA 968,748,850,877,852,892,582,
200,38,494,13,700,469,791,673,9147
1210 DATA 939,470,33,79,5,249,860,803,
892,800,937,846,881,358,245,8397
1360 DATA 55,32,965,398,165,882,660,11
4,874,393,1,272,552,23,567,5953
```

```
1510 DATA 684,738,124,913,343,883,596,
959,57,66,219,675,489,602,405,7753
1660 DATA 345,376,708,976,623,626,341,
3995
```

•

## Listing 2.
## Assembly listing.

```
*******************
* COSMIC DEFENDER *
*       BY        *
*  PHILLIP ROEY   *
*******************
;
; OPERATING SYSTEM EQUATES
;
AUDCTL   =  $D208
SKCTL    =  $D20F
AUDF1    =  $D200
AUDC1    =  $D201
AUDF2    =  $D202
AUDC2    =  $D203
AUDF3    =  $D204
AUDC3    =  $D205
AUDF4    =  $D206
AUDC4    =  $D207
ATRACT   =  $4D
VERTI    =  $0200
DMACTL   =  $022F
DLST     =  $0230
GRACTL   =  $D01D
GPRIOR   =  $026F
PMBASE   =  $D407
COLPM0   =  704
COLPM1   =  705
HCOLPM0  =  $D012
HCOLPM1  =  $D013
HCOLPM2  =  $D014
HCOLPM3  =  $D015
COLP0    =  708
COLP1    =  709
COLP2    =  710
COLP3    =  711
COLBK    =  712
HCOLP0   =  $D016
HCOLP1   =  $D017
HCOLP3   =  $D019
CONSOL   =  $D01F
KEY      =  $02FC
HPOSP0   =  $D000
STICK    =  $D300
TRIG0    =  $D010
TIMER3   =  $021C
TIMER4   =  $021E
TIMER5   =  $0220
TIMERF3  =  $022A
TIMERF4  =  $022C
TIMERF5  =  $022E
NMIEN    =  $D40E
SETVBV   =  $E45C
XITVBV   =  $E462
SIOINI   =  $E465
HSCROL   =  $D404
WSYNC    =  $D40A
CHBAS    =  756
SIZEM    =  $D00C
M0PF     =  $D000
M0PL     =  $D008
P0PF     =  $D004
P0PL     =  $D00C
HITCLR   =  $D01E
CHORG    =  $E000
RANDOM   =  $D20A
;
; PAGE ZERO EQUATES
;
         *=  $80
;
KILLU    .DS 1        COLLISION
KILLIT   .DS 1        FLAGS
KILLPL   .DS 1        DITTO
OVER     .DS 1        GAMEOVER?
FRAME    .DS 1        COUNTER
PAUSE    .DS 1        PAUSE FLAG
SNDF1    .DS 1        MISSLE SND
SND1     .DS 1        LOCATIONS
OXM0     .DS 1        MISSLE X
OYM0     .DS 1        MISSLE Y
XPY      .DS 1        EXPLOSION Y
XPIMAGE  .DS 1        EXP. IMAGE#
EXPTIME  .DS 1        EXP. TIMER
TEMPLO   .DS 1
TEMPHI   .DS 1
SCRTEMP  .DS 1
EXPLODE  .DS 1        EXP. SOUND CNTR
TEMP     .DS 1
TEMP2    .DS 1
NONEW1   .DS 1        SCROLL FLAG
XPLON    .DS 1        EXP. FLAG
ABX      .DS 1        SCREEN POS. LSB
ABY      .DS 1        SCREEN POS. MSB
FX       .DS 1
FY       .DS 1
OX       .DS 1        PLAYER X
OY       .DS 1        PLAYER Y
MSL0     .DS 1        MISSLE FLG
CSHIFT   .DS 1        DLI COLOR
DSHIFT   .DS 1        SHIFT USE
TITLF    .DS 1        TITLE SCRN FLAG
ROCKSPD  .DS 11
ROCKPOS  .DS 11       NASTY X LOC
RIMAGE   .DS 11
COLOR2   .DS 11       COLORS OF
COLOR3   .DS 11       NASTIES
ADR      .DS 2
DLINE    .DS 1        NASTY COUNTER
;
; MISCELLANEOUS EQUATES
;
SCRN     =   $3000    SCREEN MEM.
PLAYER   =   $00      PMG MEMORY
;
         *=  $2000    ORIGIN
;
; INITIALIZATION OF GAME
;
START    CLD
         LDY # <MAIN POINT TO
         LDX # >MAIN VBI ROUTINE
         LDA #7
         JSR SETVBV
         LDA #$3E     ENABLE PMG
         STA DMACTL
         LDA #$03
         STA GRACTL
         LDA #34
         STA GPRIOR
         LDA #5       SET MISSLE
         STA SIZEM    SIZE
         LDA #100
         STA COLP0    SET
         LDA #$26     PLAYFIELD
         STA COLP1    AND P/M
         LDA #$38     COLORS
         STA COLP2
         LDA #$D4
         STA COLP3
         LDA #0
         STA COLBK
         LDA #170
         STA COLPM0
         LDA #$36
         STA COLPM1
         LDA # >PLAYER POINT TO
         STA PMBASE  P/M AREA
;
; MAKE 3 COPIES OF CHAR SET
;
         LDY #0
COPY     LDA CHORG,Y
         STA PLAYER+$0800,Y
         STA PLAYER+$0C00,Y
         STA PLAYER+$1000,Y
         LDA CHORG+256,Y
         STA PLAYER+$0900,Y
         STA PLAYER+$0D00,Y
         STA PLAYER+$1100,Y
         DEY
         BNE COPY
;
; INSTALL CUSTOM CHARACTERS
;
         LDY #119
INST     LDA CHSET,Y
         STA PLAYER+$0808,Y
         LDA CHSET2,Y
         STA PLAYER+$0C08,Y
         LDA CHSET3,Y
         STA PLAYER+$1008,Y
         DEY
         BPL INST
         LDA # >PLAYER+$0800 POINT TO
         STA CHBAS    NEW CHAR. SET
;
; EACH NEW GAME STARTS HERE
;
BEGIN    JSR PLRINT   CLEAR P/M
         JSR SNDINT   KILL SOUND
         JSR CLRSCRN  CLR SCREEN
         JSR VARINT   INITIALIZE VARIABLES
         JSR TITLE    DISPLAY TITLES
         JSR GRID     ADD FFIELDS
         JSR ROCKS    AND ROCKS
         JSR ROCKINT  AND NASTIES
;
; MAIN GAME LOOP
;
MLOOP    JSR COLDET   CHECK FOR COLLISIONS
         LDA CONSOL   ABORT GAME?
         CMP #3       (OPTION)
         BNE MLOOP    NO,LOOP
         BEQ BEGIN    YES,RESTART
;
; INITIALIZE SOUND CHANNELS
;
SNDINT   JSR SIOINI
         LDA #0
         STA EXPLODE
         LDY #7
         STA AUDCTL
SN1      STA AUDF1,Y
         DEY
         BPL SN1
         RTS
;
; ADD ROCKS TO SCREEN
;
ROCKS    LDA LEVEL    GET NUMBER
         SEC          OF ROCKS,
         SBC #17      AND PUT IN
         TAY          X REG
         LDA #0
         STA ADR
         LDA NUMROCK,Y
         STA TEMP     AND TEMP
         TAX
R1       LDA RANDOM   GET A VALID
         CMP #250     RANDOM
         BCS R1       LOCATION
         TAY
R2       LDA RANDOM
         AND #$3E
         CMP #40
         BCS R2
         ADC #1       CHECK IF IT
```

```
         JSR EMPTY    IS EMPTY
         BNE R1       NEXT!
         LDX TEMP     GET # OF ROCKS FOR
R3       LDA RANDOM   2ND PAGE OF SCRN MEM
         CMP #48      GET A VALID
         BCC R3       LOCATION
         CMP #255
         BEQ R3
         TAY
R4       LDA RANDOM
         AND #$3E
         CMP #40
         BCS R4
         JSR EMPTY    LOOK FOR AN EMPTY SEAT.
         BNE R3       NEXT!
         RTS
;
EMPTY    CLC          CHECK TO MAKE
         ADC # >SCRN  SURE THE SPACE
         STA ADR+1    FOR ALL FOUR
         LDA (ADR),Y  PARTS IS VACANT
         INY
         ORA (ADR),Y
         INC ADR+1
         INC ADR+1
         ORA (ADR),Y
         DEY
         ORA (ADR),Y
         BNE RX       NO VACANCY! EXIT
         DEC ADR+1    POKE 4
         DEC ADR+1    PART ROCK
         LDA #1       INTO
         STA (ADR),Y  SCREEN
         LDA #2       MEMORY
         INY          IN LIVING
         STA (ADR),Y  COLOR...
         INC ADR+1
         INC ADR+1
         LDA #4
         STA (ADR),Y
         LDA #3
         DEY
         STA (ADR),Y
         LDA # >SCRN
         STA ADR+1
         DEX          DEC COUNTER
RX       RTS
;
NUMROCK  .BYTE 40,60,70,100,125,70,100,80,100
;
; CHECK FOR COLLISIONS
;
COLDET   LDA M0PF     HAS MISSLE HIT?
         BEQ C1       NO,CONT...
         STA KILLIT   YES,SET FLG
C1       LDA M0PL     HIT NASTY?
         AND #$FC
         BEQ C2       NO,CONT...
         STA KILLPL   YES,SET FLG
C2       LDA P0PF     HIT WALL OR ROCK?
         BNE DIE      YES,SET FLAG
         LDA P0PL     DID WE RUN
         AND #$FD     INTO NASTY?
         BEQ NODIE    NO. EXIT
DIE      STA KILLU
         STA HITCLR
NODIE    RTS
;
; CLEAR OUT SCROLLING PORTION OF SCREEN
;
CLRSCRN  LDA #42+ >SCRN 21 LINES *
         STA ADR+1    2 PAGES + SCRN ADDR
         LDX #0
         STX ADR
         LDY #0
CL1      TXA          LOOP UNTIL
         STA (ADR),Y  WE'VE GOT
         INY          LOTS OF
         BNE CL1      NOTHING
         DEC ADR+1
         LDA # >SCRN-1
         CMP ADR+1
         BNE CL1
         RTS
;
; ZERO OUT P/M MEMORY
;
PLRINT   LDA #0
         TAY
PL1      STA PLAYER+$0300,Y
         STA PLAYER+$0400,Y
         STA PLAYER+$0500,Y
         STA PLAYER+$0600,Y
         STA PLAYER+$0700,Y
         INY
         BNE PL1
         RTS
;
; REINITIALIZE GAME VARIABLES
;
VARINT   LDA #0
         STA PAUSE
         STA KILLU
         STA KILLIT
         STA KILLPL
         STA FX
         STA FY
         STA XPY
         STA XPIMAGE
         STA ABX
         STA NONEW1
         LDA # >SCRN
         STA ABY
         LDA #19
         STA LIVES
         STA OVER
         LDA #$54     LOAD MEMORY SCAN
         STA ML2
         STA HITCLR
         LDA #50
         STA OX
         LDA #100
         STA OY
         STA FRAME
         RTS
;
; PLAYER BUYS CEMENT OVERSHOES
;
BITEIT   LDA XPLON    ALREADY BITING IT?
         BNE BT1      YES,CONT...
         STA SND1     KILL SOUND
         STA XPIMAGE
         STA HPOSP0+1 EXPLOSION
         LDA #1       SET DEATH
         STA XPLON    FLAG
         JSR SNDINT   KILL REST OF SOUND
         JSR MISEND   AND MISSLE
         LDA #100     SET TIMER
         STA FRAME
         LDA #20
         STA AUDCTL   MAKE DEATH
         LDA #200     TYPE NOISES
         STA AUDF4
         LDA #135
         STA AUDC3
         STA AUDC4
BT1      LDA RANDOM   FLASH
         AND #6       SHIP
         STA HCOLPM0  IN A NICE
         STA HCOLPM1  GREY
         LDA RANDOM   PALLOR.
         STA AUDF1    MORE NOISE
         LDA RANDOM
         STA AUDF2
         LDA RANDOM
         AND #$DF
         STA AUDC1
         STA AUDC2
         DEC FRAME    DONE KILLING?
         BNE DEDEND   NO.
         JSR SNDINT   KILL NOISE
         LDA #50      REST SHIP
         STA OX       LOCATION
         STA HITCLR
         LDA #100
         STA OY
         LDA #0
         STA XPLON    CLEAR FLAGS
         STA KILLU
         DEC LIVES    ZAP A LIFE
         LDA LIVES    ANY LEFT?
         CMP #16
         BEQ GMOVER   NO? THE BIG SLEEP!
         LDA #0       YES,RESET
         STA ABX      TO START
         LDA # >SCRN  OF SCREEN
         STA ABY
         STA HITCLR
         JSR SCREEN   CLEAN UP
         JSR PLRINT   SCREEN AND
         JSR ROCKINT  NASTIES
DEDEND   JMP XITVBV
;
GMOVER   JSR PLRINT   CLEAN UP
         JSR SNDINT   SCREEN +
         LDA #0       SOUND
         STA KILLU    AND
         LDA #1       SET GAME
         STA HITCLR   OVER
         STA OVER     FLAG
         LDA # <BLANK PUT GAME
         STA ML1+1    OVER
         STA ML3+1    INTO THE
         LDA # >BLANK MIDDLE OF
         STA ML1+2    THE SCREEN
         STA ML3+2
         LDA # <MESSAGE
         STA ML2+1
         LDA # >MESSAGE
         STA ML2+2
         LDA #$46
         STA ML2
         LDA #255
         STA TIMERF5  HANG
         STA TIMER5   AROUND
GM1      LDA TIMERF5  AWHILE
         BNE GM1      THEN
         JMP BEGIN    ALL OVER
;
; VERTICAL BLANK INTERRUPT
; THIS IS WHERE ALL THE ACTION IS!
;
MAIN     LDA #0
         STA DLINE    POINT TO
         LDA OVER     IS GAME ASLEEP?
         BNE ENDVB    YES,BYE...
         STA ATRACT   NO ATTRACT MODE
         LDA KILLPL   HIT NASTY?
         BEQ MA2      NO,CONT..
         JSR XPINIT   YES,KILL
         JSR KILLPLR  IT
MA2      LDA KILLU    HIT US?
         BEQ MA1      NO,CONT...
         JMP BITEIT   YES,SUICIDE
MA1      LDA KEY      SPACEBAR
         CMP #$21     PRESSED
         BNE NOKEY    NO,BYE
         LDA #255     YES TOGGLE
         STA KEY      PAUSE
         LDA PAUSE    FLAG
         EOR #255
         STA PAUSE
NOKEY    LDA PAUSE    FLAG SET?
         BNE ENDVB    YES,BYE...
         JSR ANIMATE  ROTATE CHAR SETS
         JSR ATTACK   MOVE NASTYS
         JSR RSTICK   READ JOYSTICK
         JSR MOVE     MOVE SHIP
         JSR MISL     AND MISSLES
         JSR SOUND    BOOM
         JSR XPLODE   FIREWORKS
         JSR SCROLL   SCROLL SCREEN
         JSR SCREEN   UPDATE DISP. LIST
ENDVB    LDA TITLF    TITLES?
         BEQ EN1      NO,BYE...
         LDA # <TDLI
         STA VERTI
         LDA # >TDLI
         STA VERTI+1
EN1      JMP XITVBV
;
; READ JOYSTICK
;
RSTICK   LDA STICK    GET STICK
         LDX OY       CHECK STICK FOR
         LSR A        MOVEMENT IN A
         BCS RS1      DIRECTION AND
         CPX #32      CHECK IF WE ARE
         BEQ RS1      AT OUR LIMITS IN
         DEC OY       THAT DIRECTION
RS1      LSR A
         BCS RS2
         CPX #190
         BEQ RS2
         INC OY
RS2      LDX OX
         LSR A
         BCS RS3
         CPX #50
         BEQ RS3
         DEC OX
RS3      LSR A
         BCS RS4
         CPX #100
         BEQ RS4
         INC OX
RS4      RTS
;
; MOVE PLAYER0 AND MISSLE1 (YOUR SHIP)
;
MOVE     LDX OX
         STX HPOSP0
         INX
         INX
         STX HPOSP0+5
         LDY OY
         LDX #8
MO0      LDA SHAPE,X
         STA PLAYER+$0400,Y
         LDA PLAYER+$0300,Y
         AND #$F3
         STA PLAYER+$0300,Y
         INY
         DEX
         BPL MO0
         LDY OY
         LDA PLAYER+$0303,Y
         ORA #$0C
         STA PLAYER+$0303,Y
         LDA PLAYER+$0304,Y
         ORA #$04
         STA PLAYER+$0304,Y
         LDA PLAYER+$0305,Y
         ORA #$0C
         STA PLAYER+$0305,Y
         RTS
```

```
;
; SHIP SHAPE (ARGH!)
;
SHAPE    .BYTE 0,$C0,$70,0,$73,0,$70,$C0,0
;
; MOVE MISSLE AND MISSLE SOUND
;
MISL     LDA MSL0     ACTIVE?
         BNE MSMOV    YES,MOVE IT
         LDA TRIG0    TRIGGER PRESSED?
         BNE MSLEND   NO,BYE...
         LDA #1       SET FLAG
         STA MSL0
         LDY OY       GET Y COORD
         LDA #3       PUT MISSLE ON SCREEN
         STA PLAYER+$0304,Y
         STY OYM0     STORE Y
         LDA #$25     INITIALIZE
         STA AUDC1    MISSLE
         LDA #50      SOUND
         STA SNDF1
         LDA OX       CALCULATE
         ADC #6       INITIAL X
         STA OXM0     COORD
MSMOV    INC OXM0     MOVE MISSLE
         INC OXM0     RIGHT
         LDA OXM0
         STA HPOSP0+4
         INC SNDF1    DECREASE
         INC SNDF1    FREQUENCY
         LDA SNDF1
         STA AUDF1
         LDA #205     MISSLE AT EDGE?
         CMP OXM0
         BCC MISEND   YES,KILL MISSLE
         LDA KILLIT   DID MISSLE HIT?
         BEQ MSLEND   NO,BYE...
         JSR LOCATE   YES,BUT WHAT&WHERE
         JSR ERASE    ZAP IT
MISEND   LDA #0       MISSLE DEAD
         STA AUDC1    SO KILL SOUND
         STA MSL0     CLEAR FLAG
         STA KILLIT
         LDY OYM0     ERASE MISSLE
         LDA PLAYER+$0304,Y
         AND #$FC
         STA PLAYER+$0304,Y
MSLEND   RTS
;
; SCROLL SCREEN
;
SCROLL   LDA TIMERF3 TIME YET?
         ORA NONEW1   OR AT END OF LEVEL?
         BNE M2       THEN DON'T SCROLL
         LDA LEVEL    GET SCROLL
         SEC          SPEED
         SBC #17      AND DROP
         TAY          IT IN TIMER
         LDA SPEED,Y 3 AND RESET
         STA TIMER3   FLAG
         STA TIMERF3
         LDY FX       SCROLLED WHOLE
         DEY          CHARACTER?
         BPL M15      NO,CONT...
         INC ABX      YES, UPDATE SCREEN ADD.
         BNE M14      WHOLE PAGE DONE?
         INC ABY      YES, BUMP SCREEN PAGE
M14      LDY #3       RESET
M15      STY FX       SCROLL CNTR
M2       LDX FX
         STX HSCROL
         RTS
;
; UPDATE SCREEN MEMORY IN DL
;
SCREEN   LDY # >SCRN+$0200 ARE WE AT
         LDA ABY      THE END OF
         CPY ABY      2ND PAGE OF SCREEN?
         BNE S11      NO,CONT..
         DEC NONEW1   YES,DELAY TILL NEW LEVEL
         BNE SXIT     BYE...
         JSR LEVELUP SET UP NEW LEVEL
         LDA # >SCRN RESET TO SCRN START
S11      PHA
         LDX #20      # OF LINES TO BE SCROLLED
         LDY #6       OFFSET IN DL
S0       LDA ABX      GET LSB AND
         STA DSP,Y    STORE IN DL
         INY
         PLA          GET MSB AND
         STA DSP,Y    STORE IN DL
         CLC          ADD TWO
         ADC #2       PAGES
         PHA          AND HIDE IT ON STACK TILL
         INY          LOOP
         INY          INC DL POINTER
         DEX          DONE?
         BPL S0       NO,LOOP..
         PLA          YES, CLEAR STACK
SXIT     RTS
;
SPEED    .BYTE 3,3,2,2,2,2,2,1,1

;
; SCORE ROUTINE:ENTRY CONDITION
; XREG: SCORE DIGIT TO CHANGE
; YREG: AMOUNT TO ADD TO DIGIT
;
SCOREIT  INC SCORE,X GET DIGIT
         LDA SCORE,X AND BUMP IT
         CMP #26      DIGIT>9?
         BEQ BIGSCR   YES. FIX IT
SCR      DEY          NO. ARE WE
         BEQ SCREND   DONE? YES.
         BNE SCOREIT NO. LOOP
BIGSCR   LDA #16      DIGIT=0
         STA SCORE,X STORE IT
         STA SCRTEMP SCORE CARRY FLAG
         BNE SCR      LOOP...
;
SCREND   LDA SCRTEMP FLAG SET?
         BEQ SC1      NO.
         TXA          LAST DIGIT?
         BEQ SC1      YES.
         DEX          SET XREG
         LDY #1       AND YREG
         LDA #0       CLEAR FLAG
         STA SCRTEMP AND START
         BEQ SCOREIT ALL OVER
SC1      JMP HIGHSC   CHECK FOR HIGH SCORE
;
; FIND OUT WHERE WE HIT
;
LOCATE   LDA OYM0     GET Y COORD
         SEC          AND CONVERT
         SBC #29      TO IRG4
         LSR A        SCREEN
         LSR A        COORDINATES
         AND #$FE     ADD THE
         CLC          START OF
         ADC DSP+7    SCREEN MEM.
         STA TEMPHI   SHAKE WELL AND VIOLA! THE MSB
         LDA FX       GET LSB OF
         ASL A        SCREEN
         CLC          ADD THE MISSLES
         ADC OXM0     X COORD
         SEC          CONVERT
         SBC #39      TO IRG4
         LSR A        COORDINATES
         LSR A        ADD SCROLL
         CLC
         ADC ABX      AND WE GET
         STA TEMPLO   THE LSB
         BCC LOC1     OVER BORDER THEN
         INC TEMPHI   BUMP MSB
LOC1     RTS
;
; FIND OUT WHAT WE HIT
;
ERASE    LDA TEMPLO   GET SCREEN
         STA ADR      MEMORY AND
         LDA TEMPHI   SEARCH TILL
         STA ADR+1    WE FIND A
         STA HITCLR   NONZERO
         LDY #0       CHARACTER
         LDA (ADR),Y (A VICTIM!)
         BNE GOTIT
         INY
         LDA (ADR),Y
         BNE GOTIT
         INY
         LDA (ADR),Y
         BEQ LOC1
GOTIT    CMP #1       IF CHAR IS
         BEQ ERASE4   1-4,ITS A
         CMP #2       ROCK.
         BNE GOT1     SET TO TOP
         DEC ADR      RIGHT CHAR
         JMP ERASE4   OF ROCK,
GOT1     CMP #3       THEN JUMP
         BEQ GOT2     TO ERASE4
         CMP #4
         BNE GOT4
         DEC ADR
GOT2     DEC ADR+1
         DEC ADR+1
         JMP ERASE4
GOT4     CMP #10      GENERATOR?
         BNE GOT5     NO,CONT..
         LDA #13      YES,KILL IT
         STA (ADR),Y SET TO TOP
         INC ADR+1    OF FIELD.
         INC ADR+1
         JMP ERASE2V ERASE IT!
GOT5     CMP #9       LOWER GENERATOR?
         BNE LOC1     NO,BYE..
         LDA #13      YES,KILL IT
         STA (ADR),Y SET TO TOP
         DEC ADR+1    OF FORCE
         DEC ADR+1    FIELD.
         DEC ADR+1
         DEC ADR+1
         JMP ERASE2V ERASE IT.
;
ERASE4   LDA #0       ERASE THE
         STA (ADR),Y FOUR PART
         INC ADR+1    ROCK BY
         INC ADR+1    STORING A
         STA (ADR),Y BLANK IN
         INY          EACH OF
         STA (ADR),Y THE FOUR
         DEC ADR+1    FORMER
         DEC ADR+1    POSITIONS
         STA (ADR),Y
         LDX #3       SET SCORE
         LDY #5       TO 50 PTS.
         BNE ER2
;
ERASE2V  LDA #0       STORE A
         STA (ADR),Y BLANK CHAR
         INC ADR+1    IN THE 2
         INC ADR+1    FORCE FIELD
         STA (ADR),Y POSITIONS
         LDX #2       SET SCORE
         LDY #2       TO 200 PTS.
ER2      STA KILLIT   CLR COLLISION FLG
         JSR SCOREIT
         LDA #25      SET BOOM
         STA EXPLODE COUNTER
         JMP XPINIT   FIREWORKS
;
; BOOM!
;
SOUND    LDA EXPLODE FLAG SET?
         BEQ SNDEND   NO,BYE...
         LDA TIMERF4 TIME YET?
         BNE SNDEND   NO,BYE...
         DEC EXPLODE SET TO NEXT
         LDA EXPLODE TONE+CONTRL
         STA TIMERF4 RESET FLAG
         BEQ SNDEND   ANY LEFT? NO,BYE
         TAY          YES,GET
         LDA EXPSND,Y THE NEXT
         STA AUDF2    TONE + CTL
         LDA RANDOM   AND PUT'EM
         ORA #$C0     IN (THE)
         STA AUDF3    POKEY
         LDA EXPTONE,Y
         ORA #$40
         STA AUDC2
         STA AUDC3
         LDA #2
         STA TIMER4
SNDEND   RTS
;
EXPSND   .BYTE $F5,$F4,$F3,$F2,$F2
         .BYTE $F0,$F2,$F5,$E9,$E0
         .BYTE $EF,$F0,$F1,$F2,$F3
         .BYTE $F4,$F5,$F4,$F1,$F5
         .BYTE $F2,$F3,$F4,$F5,$F5
EXPTONE  .BYTE 0,0,1,2,3,4,5,5,6,6
         .BYTE 7,7,8,8,9,9,9,10,10,10
;
; NEXT LEVEL,PLEASE....
;
LEVELUP  INC LEVEL    BUMP LEVEL
         LDA LEVEL    LVL>9?
         CMP #26
         BNE LV2      NO,CONT...
         LDA #20      YES,BACK TO
         STA LEVEL    LEVEL FOUR
LV2      LDA #$40     DISABLE INTERRUPTS
         STA NMIEN    AND TELL COMPUTER
         PHP          TO STAY PUT
         SEI          TILL NOTIFIED!
         JSR CLRSCRN CLEAR SCRN
         LDA #0       RESET TO
         STA ABX      SCRN START
         STA MSL0     KILL MISSLE
         JSR SNDINT   AND SOUND
         LDA # >SCRN PAGE 1 OF
         STA ABY      SCREEN
         JSR SCREEN   UPDATE DL
         STA HITCLR   CLEAR COLLISIONS
         JSR GRID     ADD GRIDS
         JSR ROCKS    AND ROCKS
         LDA #0       RESET AND
         LDX #10      ADD NASTIES
LV1      STA RIMAGE,X
         DEX
         BPL LV1
         JSR ROCKINT
         INC LIVES    ADD AN EXTRA LIFE
         PLP          AND BACK TO
         LDA #$C0     THE REAL
         STA NMIEN    WORLD....
         RTS
;
;  ROTATE CHARACTER SETS
;
ANIMATE  LDA TIMERF5 TIME YET?
         BNE AN3
         LDA #4       RESET TIMER
         STA TIMER5   AND FLAG
         STA TIMERF5
         LDA CHBAS
         CMP # >PLAYER+$1000 3RD SET?
         BEQ AN2      OOPS..
```

```
         CLC           NO,ADD 1K
         ADC # >1024 TO CHBAS
         BNE AN1       JMP ALWAYS
AN2      LDA # >PLAYER+$0800 RESET TO
AN1      STA CHBAS     1ST CHAR
AN3      RTS           SET AND BYE
;
; HIGH SCORE?!?!?!
;
HIGHSC   LDY #0        CHECK SCORE
HI1      LDA SCORE,Y FROM MS TO
         CMP HIGH,Y    LS DIGIT
         BEQ HI3       EQUAL LOOP
         BCC HSCOREND LOWER,CONT
         BCS NEWHIGH REPLACE HIGH SCORE
HI3      INY
         CPY #4
         BNE HI1       LOOP....
NEWHIGH  LDY #0        COPY
NH1      LDA SCORE,Y SCORE INTO
         STA HIGH,Y    HIGH SCORE
         INY
         CPY #4
         BNE NH1       LOOP...
HSCOREND RTS
;
; ADD FORCE FIELD GRIDS
;
GRID     LDA LEVEL     GET SPACE
         SEC           BETWEEN
         SBC #17       GRIDS FOR LEVEL
         TAX
         LDA GATES,X AND THROW
         STA TEMP      IN TEMP
         LDY #0        THEN GET
         LDA # >SCRN OFFSET AND
         STA TEMP2     ADD IT TO
         LDA OFFSET,X START OF
         STA ADR       SCREEN MEM.
GR1      LDA TEMP2     POKE THE
         STA ADR+1     3 GRID
         LDX #7        CHARACTERS
GR2      LDA #5        INTO
         STA (ADR),Y MEMORY
         INC ADR+1
         INC ADR+1
         LDA #6
         STA (ADR),Y
         INC ADR+1
         INC ADR+1
         LDA #7
         STA (ADR),Y
         INC ADR+1
         INC ADR+1
         DEX
         BNE GR2
GR3      LDA RANDOM    FIND A
         AND #$1F      VALID GATE
         CMP #20       LOCATION
         BCS GR3
         CMP #5
         BCC GR3
         DEC ADR       AND ADD THE
         ASL A         FORCE FIELD
         CLC           AND
         ADC TEMP2     GENERATORS
         STA ADR+1
         LDA #8
         STA (ADR),Y
         DEC ADR+1
         DEC ADR+1
         LDA #9
         STA (ADR),Y
         DEC ADR+1
         DEC ADR+1
         LDA #140      FORCEFIELD
         STA (ADR),Y
         INY
         LDA #0
         STA (ADR),Y
         DEC ADR+1
         DEC ADR+1
         STA (ADR),Y
         DEY
         LDA #139      FORCEFIELD
         STA (ADR),Y
         DEC ADR+1
         DEC ADR+1
         LDA #10
         STA (ADR),Y
         DEC ADR+1
         DEC ADR+1
         LDA #8
         STA (ADR),Y
         LDA ADR       ADD SPACE
         ADC TEMP      AND SCREEN
         STA ADR       LOCATION
         BCC GR1       BUMP MSB
         INC TEMP2     IF
         LDA TEMP2     NECESSARY
         CMP # >SCRN+$0100 OUT OF ROOM?
         BEQ GR1       NO,LOOP..
         RTS
;
GATES    .BYTE 255,150,60,30,30,60,60,90,70
OFFSET   .BYTE 255,200,100,75,50,50,50,200,100
;
; MAIN GAME DLI
;
DLI      PHA           SAVE XREG
         TXA           AND A REG
         PHA
         LDX DLINE     INC NASTY
         INC DLINE
         LDA ROCKPOS,X GET LOCATION
         STA HPOSP0+3 AND STORE IN PLR2
         STA HPOSP0+2 AND PLR3
         LDA COLOR2,X PUT COLOR
         STA HCOLPM2 DIRECTLY
         LDA COLOR3,X INTO
         STA HCOLPM3 HARDWARE REGISTERS
         CPX #10       ANY LEFT?
         BNE DL1       YES,LOOP..
         LDA # <DLI2 NO,POINT
         STA VERTI     TO NEXT
         LDA # >DLI2 DLI
         STA VERTI+1
DL1      PLA           RESTORE A
         TAX           AND X
         PLA
         RTI
;
DLI2     PHA
         LDA #$F8      POKE SCORE
         STA HCOLP0    COLORS
         LDA #$98      DIRECTLY
         STA HCOLP1    INTO
         LDA #38       HARDWARE
         STA HCOLP3    REGISTERS
         LDA # <DLI    POINT TO
         STA VERTI     MAIN
         LDA # >DLI    DLI
         STA VERTI+1
         PLA
         RTI
;
; ATTACTING NASTIES.....
;
ATTACK   LDX #0
         STX DLINE
AT3      LDA ROCKSPD,X NASTY ACTIVE?
         BEQ AT1       NO,GIVE IT LIFE!
         LDA ROCKPOS,X YES MOVE
         SEC           IT
         SBC ROCKSPD,X LEFT
         BNE AT2       STILL ON SCREEN?
         STA ROCKSPD,X NO, RESET POSITION
         LDA #254      AND SPEED
AT2      STA ROCKPOS,X
AT4      INX           MORE
         CPX #10       NASTIES?
         BNE AT3       YES,LOOP..
         RTS
AT1      LDA NONEW1    NOT END OF LEVEL?
         ORA RANDOM    CAN WE GIVE IT LIFE?
         BNE AT4       NO,DRATS..
         LDA #1
         LDY RANDOM
         CPY #15       A FAST ONE?
         BCS AT0
         LDA #2        YES. FUN!!!
AT0      STA ROCKSPD,X
         LDA LEVEL     LVL>6?
         CMP #22
         BCC AT10      NO. LOOP
         INC ROCKSPD,X SPEED THINGS UP
AT10     JMP AT4       LOOP....
;
IMAGE2   .BYTE 0,0,0,0,0,0,$78,$FC
         .BYTE $78,0,0,0,0,0,0,0
         .BYTE 0,0,0,0,$1C,$3E,$7F,$6B
         .BYTE $7F,$5D,$22,$1C,0,0,0,0
         .BYTE 0,0,0,0,0,0,$7F,$F8
         .BYTE $7F,0,0,0,0,0,0,0
         .BYTE 0,0,0,0,$18,$3C,$7E,$3C
         .BYTE $5A,$66,$7E,$3C,$18,0,0,0
         .BYTE 0,0,0,0,7,$0F,$0E,$1C
         .BYTE 0,$1C,$0E,$0F,7,0,0,0
         .BYTE 0,0,0,0,0,0,$2C,$24
         .BYTE $2F,$3D,9,$0F,0,0,0,0
         .BYTE 0,0,0,0,0,0,$10,$38
         .BYTE $7C,$38,$10,0,0,0,0,0
         .BYTE 0,0,0,0,0,0,0,2
         .BYTE 7,2,0,0,0,0,0,0
IMAGE1   .BYTE 0,0,0,7,$0E,$3C,0,$FC
         .BYTE 0,$3C,$0E,7,0,0,0,0
         .BYTE 0,0,0,0,0,0,0,$14
         .BYTE 0,$22,$1C,0,0,0,0,0
         .BYTE 0,0,0,0,3,7,$3F,$3F
         .BYTE $3F,7,3,0,0,0,0,0
         .BYTE 0,0,0,$18,$24,$42,$81,$C3
         .BYTE $E7,$FF,$7E,$3C,$18,0,0,0
         .BYTE 0,0,0,0,$0F,0,0,0
         .BYTE $FC,0,0,0,$0F,0,0,0
         .BYTE 0,0,0,0,$F0,$90,$90,$D0
         .BYTE $0B,$09,$09,$0F,0,0,0,0
         .BYTE 0,0,0,0,0,$10,$28,$44
         .BYTE $92,$44,$28,$10,0,0,0,0
         .BYTE 0,0,0,0,0,0,0,0
         .BYTE 2,0,0,0,0,0,0,0
;
; INITIALIZE NASTIES...
;
ROCKINT  LDA LEVEL     ARE WE
         CMP #17       PAST THE 1ST LEVEL?
         BEQ RK7       NO,BYE..
         LDA #10       READ THE
         STA TEMP      IMAGES OF
RK1      LDY #15       THE NASTIES
         LDA TEMP      (PLAYERS
         ASL A         2 AND 3)
         ASL A         INTO PMG
         ASL A         MEMORY
         ASL A         WHERE THE
         CLC           DLI WILL
         ADC #34       FIND'EM.
         TAX
RK2      LDA IMAGE1,Y
         STA PLAYER+$0600,X
         LDA IMAGE2,Y
         STA PLAYER+$0700,X
         DEX
         DEY
         BNE RK2
         DEC TEMP
         BNE RK1
         LDX #10       SET INITIAL POSITION
RK4      LDA #254      OFF SCREEN AND
         STA ROCKPOS,X ZERO SPEED
         LDA #0        SO THEY
         STA ROCKSPD,X STAY
         DEX           PUT UNTIL
         BPL RK4       WE ACTIVATE
         LDX #9        THEM
         LDA #4
RK5      CLC
         ADC #$50      GIVE EACH
         STA COLOR2,X ONE TWO
         DEX           DIFFERENT
         BPL RK5       COLORS
         LDX #9
         LDA #$88
RK6      CLC
         ADC #$30
         STA COLOR3,X
         DEX
         BPL RK6
RK7      RTS
;
; EXPLOSION (FIREWORKS)
;
XPLODE   LDA XPIMAGE GET IMAGE NUMBER.
         BEQ EXPEND    ANY LEFT? NO,BYE...
         DEC EXPTIME TIME YET?
         BNE EXPEND    NO,BYE...
         DEC XPIMAGE NEXT IMAGE
         LDA XPIMAGE
         ASL A         OFFSET IN
         ASL A         IMAGE DATA
         ASL A
         ORA #$07
         TAX
         LDA #8
         STA TEMP2
         LDY XPY
XPLOOP   LDA XPLOD,X STORE IMAGE
         STA PLAYER+$0500,Y IN PLAYER1
         DEX
         INY           NEXT BYTE
         DEC TEMP2     ANY LEFT?
         BNE XPLOOP    YES,LOOP
         LDA #6        NO SET
         STA EXPTIME TIMER
         LDA XPIMAGE
         BNE EXPEND
         STA HPOSP0+1
EXPEND   RTS
XPINIT   LDX #7        INITIALIZE
         LDA #8        EXPLOSION
         STA TEMP2
         LDY XPY       GET IT'S
         JSR XPLOOP    LOCATION
         LDA OYM0      AND PUT IT
         STA XPY       ON THE
         LDA OXM0      SCREEN THEN
         STA HPOSP0+1
         LDA #9        SET IMAGE
         STA XPIMAGE POINTER
         LDA #1        AND TIMER
         STA EXPTIME
         RTS
;
; EXPLOSION SHAPE DATA
;
```

```
XPLOD    .BYTE Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
         .BYTE $81,Ø,Ø,Ø,Ø,Ø,Ø,$81
         .BYTE $81,$42,Ø,Ø,Ø,Ø,$42,$81
         .BYTE $89,$42,$24,$8Ø,$Ø1,$24,$42,$91
         .BYTE 8,$4A,$24,$CØ,3,$24,$52,$1D
         .BYTE 8,8,$2C,$EØ,7,$34,$1Ø,$1Ø
         .BYTE Ø,8,8,$78,$1E,$1Ø,$1Ø,Ø
         .BYTE Ø,Ø,8,$38,$1C,$1Ø,Ø,Ø
         .BYTE Ø,Ø,Ø,$18,$18,Ø,Ø,Ø
;
; KILL ATTACKING NASTIES!
;
KILLPLR  LDA OYMØ     GET Y COORD
         SEC          AND CONVERT
         SBC #28      TO GET #
         LSR A        OF NASTY
         LSR A        WE HIT
         LSR A
         LSR A
         TAX
         LDA #Ø       RESET SPEED AND POSITION
         STA ROCKSPD,X
         LDA #254
         STA ROCKPOS,X
         INC RIMAGE,X SET TO
         LDA RIMAGE,X NEXT NASTY
         STA TEMP     IMAGE
         STX TEMP2    SCORE= 1ØØ
         TAY          TIMES IMAGE
         LDX #2       NUMBER+1
         JSR SCOREIT
         LDX TEMP2
         LDY TEMP     ANY IMAGES
         CPY #8       LEFT?
         BCC KL1      YES,NEXT
         LDA #Ø       NO,RESET
         STA RIMAGE,X TO IMAGE #Ø
         STA TEMP
KL1      LDA #23
         STA EXPLODE
         TXA
         ASL A        READ NEW
         ASL A        NASTY
         ASL A        INTO PMG
         ASL A        MEMORY
         CLC
         ADC #49
         TAY
         LDA TEMP
         ASL A
         ASL A
         ASL A
         ASL A
         STA TEMP
         ORA #$ØF
         TAX
KL2      LDA IMAGE1,X
         STA PLAYER+$Ø6ØØ,Y
         LDA IMAGE2,X
         STA PLAYER+$Ø7ØØ,Y
         DEY
         DEX
         CPX TEMP     DONE?
         BNE KL2      NO,LOOP...
         STX HITCLR   YES,CLEAR
         LDA #Ø       COLL. FLAG
         STA KILLPL
         JMP MISEND   KILL MISSLE
;
; TITLE SCREEN
;
TITLE    LDA # <TITLEPG PUT
         STA DLST     TITLE
         LDA # >TITLEPG PAGE ON
         STA DLST+1   SCREEN
         JSR PLRINT   GET RID OF PMG
         LDA #$CØ     ENABLE DLI'S FOR
         STA NMIEN    RAINBOW EFFECT
         INC TITLF    SET FLAG
         LDA STLEVEL  UPDATE
         STA LEVEL    LEVEL
LOOP     LDA CONSOL   IS SELECT
         CMP #5       PRESSED?
         BNE LOOP2    NO,CONT..
         INC LEVEL    YES,INC
         LDA LEVEL    LEVEL
         CMP #26      LVL>9?
         BNE LP2      NO,CONT..
         LDA #17      LVL=1
LP2      STA LEVEL
         LDA #3Ø      DELAY 1/2
         STA TIMER5   SECOND
         STA TIMERF5
LOOP2    LDA LEVEL    PUT NEW
         STA TITLE4+16 LEVEL
         JSR ANIMATE  ON SCREEN
         LDA TRIGØ    IF TRIGGER
         BEQ LP7      OR START
         LDA CONSOL   IS PRESSED
         CMP #6       CONTINUE. IF NOT
         BNE LP3      LOOP...
LP7      LDA # <DSP   POINT TO
         STA DLST     MAIN GAME
         LDA # >DSP   SCREEN
         STA DLST+1
```

```
         LDA # <DLI
         STA VERTI
         LDA # >DLI
         STA VERTI+1
         LDA #'Ø-32
         LDY #5
LP5      STA SCORE-1,Y
         DEY
         BNE LP5
         STY OVER     CLR FLAG
         STY TITLF
         LDA LEVEL    SET LEVEL
         STA STLEVEL
         RTS
LP3      LDA TIMERF5 DELAY LOOP
         BNE LOOP2
         BEQ LOOP
;
STLEVEL  .BYTE 17
;
; TITLE SCREEN DLI
;
TDLI     PHA          SAVE X AND
         TXA          A REGISTERS
         PHA
         LDX #15
         LDA DSHIFT   GET COLOR
         STA CSHIFT
TDLI1    LDA CSHIFT
         STA WSYNC    WAIT FOR NEW SCAN LINE
         STA HCOLPØ   STORE IT IN HARDWARE
         CLC          ADD TWO
         ADC #2
         STA CSHIFT
         DEX          ANY MORE LINES?
         BPL TDLI1    YES,LOOP
         LDX #15      RESET COUNT
TDLI2    LDA CSHIFT   GET COLOR
         STA WSYNC    WAIT FOR NEW LINE
         STA HCOLPØ   STORE IT
         SEC          SUBTRACT 2
         SBC #2       TO GET THE
         STA CSHIFT   MIRROR EFFECT
         DEX          ANY MORE?
         BPL TDLI2    YES,LOOP
         LDA TIMERF4  TIME YET?
         BNE TDLIX    NO,CONT..
         LDA #1       YES,RESET
         STA TIMERF4  TIMER AND
         STA TIMER4   FLAG AND
         INC DSHIFT   INC THE START COLOR
TDLIX    LDA # <DLI2  POINT TO
         STA VERTI    NEXT DLI
         LDA # >DLI2
         STA VERTI+1
         PLA          RESTORE
         TAX          REGISTERS
         PLA
         RTI
;
; TITLE PAGE DISPLAY LIST
;
TITLEPG  .BYTE $7Ø,$7Ø,$46
         .WORD SCORELN
         .BYTE $7Ø,$FØ,$47
         .WORD TITLE1
         .BYTE $47
         .WORD TITLE6
         .BYTE $7Ø,$7Ø,$46
         .WORD TITLE2
         .BYTE $46
         .WORD TITLE3
         .BYTE $FØ,$47
         .WORD TITLE5
         .BYTE $7Ø,$C6
         .WORD TITLE4
         .BYTE $7Ø,$7Ø,$7Ø
         .BYTE $7Ø,$7Ø,$7Ø,$46
         .WORD SCORELN
         .BYTE 6,6,$41
         .WORD TITLEPG
;
TITLE1   .SBYTE "       COSMIC "
TITLE6   .SBYTE "      DEFENDER"
TITLE2   .SBYTE +$8Ø,"          BY    "
TITLE3   .SBYTE +$8Ø,"       phill roey  "
TITLE4   .SBYTE "   select level:  "
TITLE5   .SBYTE +$8Ø,"  analog computing  "
;
;        DISPLAY LIST
;
DSP      .BYTE $7Ø,$7Ø,$C6
         .WORD SCORELN
         .BYTE $54
         .WORD Ø
         .BYTE $D4
         .WORD Ø
         .BYTE $54
         .WORD Ø
         .BYTE $D4
         .WORD Ø
         .BYTE $54
         .WORD Ø
         .BYTE $D4
         .WORD Ø
```

```
         .BYTE $54
         .WORD Ø
ML1      .BYTE $D4
         .WORD Ø
ML2      .BYTE $54
         .WORD Ø
ML3      .BYTE $D4
         .WORD Ø
         .BYTE $54
         .WORD Ø
         .BYTE $D4
         .WORD Ø
         .BYTE $54
         .WORD Ø
         .BYTE $D4
         .WORD Ø
         .BYTE $54
         .WORD Ø
         .BYTE $D4
         .WORD Ø
         .BYTE $54
         .WORD Ø
         .BYTE $D4
         .WORD Ø
         .BYTE $54
         .WORD Ø
         .BYTE $D4
         .WORD Ø
         .BYTE $54
         .WORD Ø
         .BYTE $C6
         .WORD SCORELN
         .BYTE 6,6,$41
         .WORD DSP
;
SCORELN  .SBYTE +$8Ø,"......................"
         .SBYTE +$8Ø," score:"
SCORE    .SBYTE "ØØØØØ"
         .SBYTE " lives:"
LIVES    .SBYTE "3"
         .SBYTE "  hi:"
HIGH     .SBYTE "ØØØØØ"
         .SBYTE "  level:"
LEVEL    .SBYTE "1"
BLANK    .SBYTE "
MESSAGE  .SBYTE "      GAME  OVER     "
;
; CHARACTER SET #1
;
CHSET    .BYTE Ø,1,1,2Ø,17,26,21,85
         .BYTE Ø,64,8Ø,8Ø,1ØØ,84,69,81
         .BYTE 89,89,26,21,17,5,1,Ø
         .BYTE 1Ø5,88,84,84,8Ø,64,Ø,Ø
         .BYTE 255,255,215,215,215,215,255,255
         .BYTE 255,255,195,195,195,195,255,255
         .BYTE 255,255,235,235,235,235,255,255
         .BYTE 15,3,3,15,15,3,3,15
         .BYTE 63,245,245,234,234,245,245,63
         .BYTE 63,245,245,234,234,245,245,63
         .BYTE 195,6Ø,Ø,195,6Ø,Ø,195,6Ø
         .BYTE Ø,195,6Ø,Ø,195,6Ø,Ø,195
         .BYTE 63,24Ø,24Ø,192,192,24Ø,24Ø,63
         .BYTE $FF,$49,$49,$49,$49,$49,$49,$FF
         .BYTE Ø,$1E,$21,$2D,$29,$2D,$21,$1E
;
; CHARACTER SET #2
;
CHSET2   .BYTE Ø,1,1,2Ø,17,26,21,85
         .BYTE Ø,64,8Ø,8Ø,1ØØ,84,69,81
         .BYTE 89,89,26,21,17,5,1,Ø
         .BYTE 1Ø5,88,84,84,8Ø,64,Ø,Ø
         .BYTE 255,255,235,235,235,235,255,255
         .BYTE 255,255,215,215,215,215,255,255
         .BYTE 255,255,195,195,195,195,255,255
         .BYTE 15,3,3,15,15,3,3,15
         .BYTE 63,245,245,192,192,245,245,63
         .BYTE 63,245,245,192,192,245,245,63
         .BYTE Ø,195,6Ø,Ø,195,6Ø,Ø,195
         .BYTE 6Ø,Ø,195,6Ø,Ø,195,6Ø,Ø
         .BYTE 63,24Ø,24Ø,192,192,24Ø,24Ø,63
         .BYTE $FF,$92,$92,$92,$92,$92,$92,$FF
         .BYTE Ø,$1E,$21,$2D,$29,$2D,$21,$1E
;
; CHARACTER SET #3
;
CHSET3   .BYTE Ø,1,1,2Ø,17,26,21,85
         .BYTE Ø,64,8Ø,8Ø,1ØØ,84,69,81
         .BYTE 89,89,26,21,17,5,1,Ø
         .BYTE 1Ø5,88,84,84,8Ø,64,Ø,Ø
         .BYTE 255,255,195,195,195,195,255,255
         .BYTE 255,255,235,235,235,235,255,255
         .BYTE 255,255,215,215,215,215,255,255
         .BYTE 15,3,3,15,15,3,3,15
         .BYTE 63,245,245,213,213,245,245,63
         .BYTE 63,245,245,213,213,245,245,63
         .BYTE 6Ø,Ø,195,6Ø,Ø,195,6Ø,Ø
         .BYTE 195,6Ø,Ø,195,6Ø,Ø,195,6Ø
         .BYTE 63,24Ø,24Ø,192,192,24Ø,24Ø,63
         .BYTE $FF,$24,$24,$24,$24,$24,$24,$FF
         .BYTE Ø,$1E,$21,$2D,$29,$2D,$21,$1E
;
         *=  $Ø2EØ   RUN PROGRAM
         .WORD START
         .END
```

# SENECOM's

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DR. QUICK TELLS HOW AN ERROR LED TO A GREAT PRODUCT:

## The UGLY Disk

**Q. Doctor Quick. Is it true that your company's remarkable new product actually resulted from a *MISTAKE?***
A. Ja. A lulu, I'm telling you! A real pip.

**Q. And the error occurred while covering up mistakes in your *NameBrand* and *LogoLine* Diskettes?**
A. Ja, but not to confuse persons by this! Here is the same best quality, not a thing wrong. Top of our line PDQ disks! So maybe a name or logo gets smudged or cludged, right? Not looking so pretty good. It happens. But not going to a customer like such, ja? Never!
So what next: they will fix it. They will cover up a name-smudging with a nice label! Ready for selling like other labelled disks, but better, ja?

**Q. Sounds like a good idea. Why didn't it work out that way?**
A. Some acid freaks come in, design a label. Call it a label? A mess we got! Then these hoop heads dream up a disk jacket fit to scare a tiger, make a elephant wet his pants. Terrible!

**Q. I hear the result is so unsightly the company decided to add another label to each disk.**
A. You hear good. Every disk got a "Ugly" on it so everybody knows *we* don't like it, too.

**Q. And now you're selling these "ugly" disks?**
A. Ja, with such a gorgeous price for top quality, who cares ugly? Ugly, shmugly! These disks every one is a two sider and, how you say it, toodle-density PDQ disk.

**Q. Double sided and double density! That's great! Do they carry a warranty like *NameBrand* and *LogoLine* Diskettes?**
A. The very one, ja, every disk made a hundred percentage error-free for 21 years, and you say so too, or getting a new one, on the house. We are talking PDQ now: the best warranty for the best disk!
For looks, well, don't wear them in public, ja?

**Q. They'll work in a single-density 810 drive?**
A. Ja, 810, 1050, 1985, you name it. With them is even a how-to-do-it writing for using disks on the turnover.

**Q. Ah, you *can* use both sides! How much do "ugly disks" cost?**
A. Sit down, this you won't believe. Up to 4 boxes of ten per each, sending only $25.70 a box! Buying 5 boxes or more, all you want, is $23.90 a box! Amazing? For toodle side, toodle density, premium grade, and 21-year gimme-back? You betcha my life amazing! I hardly believe it, too! Now I tell you a thing bad and a thing good. Which is first?

**Q. Give us the bad news first, Doctor Quick.**
A. Okay. You got to send in $2.00 with your order, for the shaping and bundling, whatever, you know? On top of the disk price. Add it right on. USA or Canada only, others more.*

**Q. That's not so bad. What's the good news?**
A. If the order is before August 31, here in 1985, subtract THREE BUCKS for every box you get. Can you believe that? Is that a nice introducer? *I* can't believe it, almost! I think I am dreaming! Pinch me!
Now here is more something good: try them, 30 days. Put them all working hard. If you don't like them twice what their costing was, send them back clean without a damage. I send you right off the purchase money, ja, true!

**Q. You've made quite an offer! You really want people to try them!**
A. You think I am here to sing *Liebestraum?* I want people should try them, ja. They try once, they will send again, sure! *If* they can stand ugly. *Whew!* Here we got champion uglies, in a clash of their own. You got to see this to *still* not believe!
Orders should hurry in right away, to:

**SENECOM**
Dept. 29
13 White St.
Seneca Falls, NY 13148
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*Orders outside USA and Canada add $1 per box plus $4 for the order. NY State residents add sales tax. If paying by check, allow 3 weeks for check to clear.

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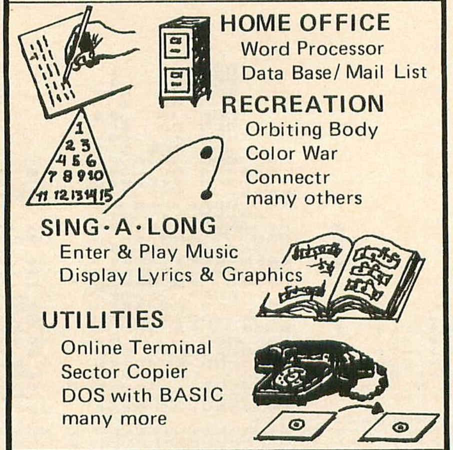

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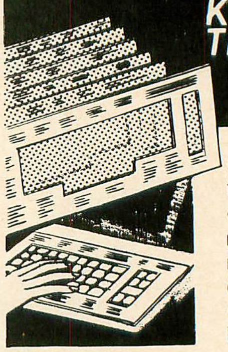

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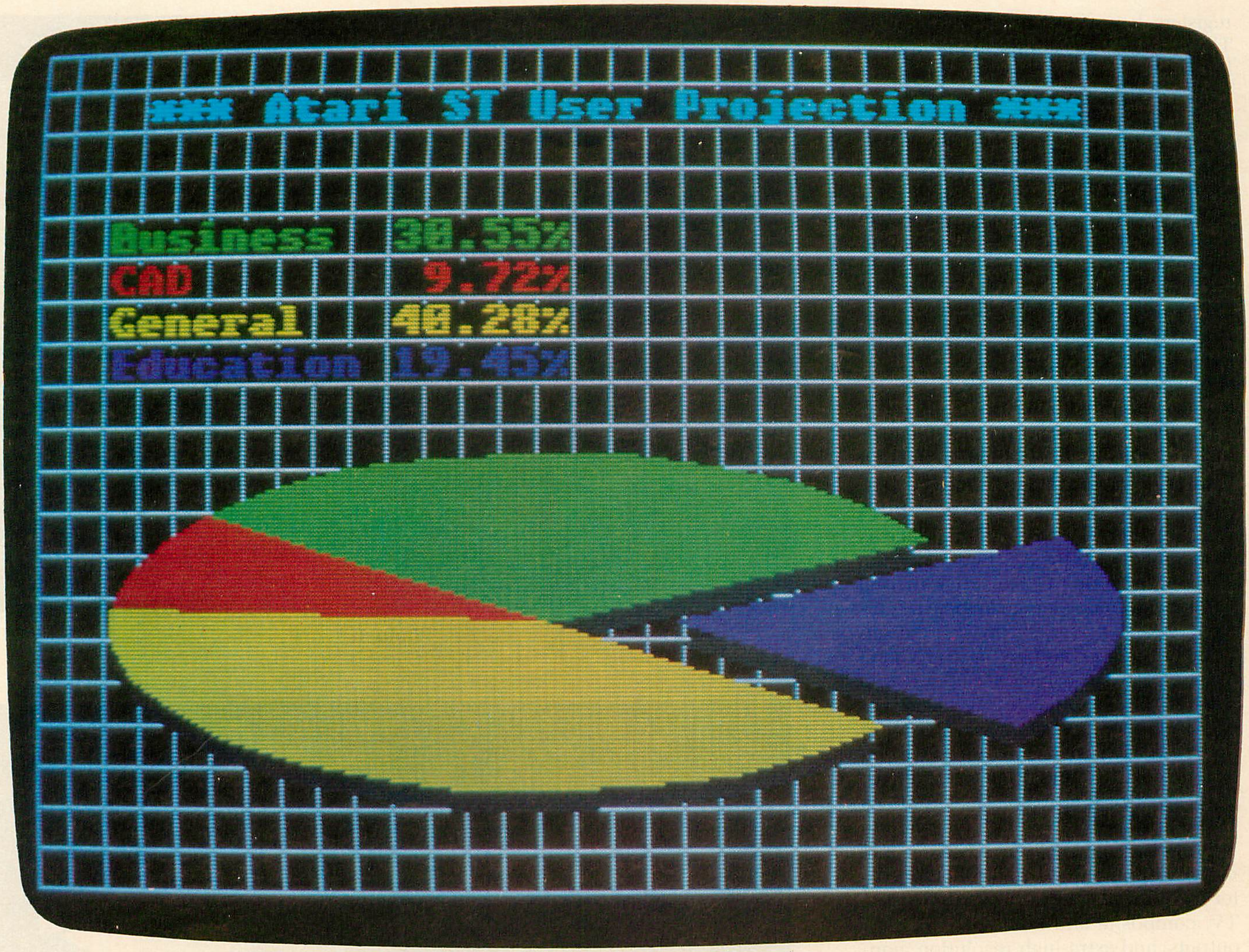


# ATARI'S 520ST: Our First Look

by Tom Hudson

It had been eagerly awaited by the **ANALOG Computing** staff since the January Consumer Electronics Show. On March 27, 1985, it arrived—Atari's new entry into the 16-bit computer market, the 520ST.

**ANALOG Computing** ordered one of the 520ST development systems as soon as it was announced that Atari was offering them to interested software developers. With an ST system in the office, we'd be able to familiarize ourselves with the programming and operation of the STs before their release to the public. This article will bring you up to date on our findings and my personal observations.

**The ST hardware.**

As most of our readers should know by now, the ST system is based on the Motorola 68000 microprocessor. Running at a clock speed of 8 megahertz, this processor is capable of handling either 16 or 32 bits of data in its internal registers, hence the name "ST" (Sixteen/Thirty-two). This ability to manipulate larger blocks of data, combined with the high clock speed, makes the ST a formidable piece of hardware.

The ST computers come in two memory sizes: 128K bytes (the 130ST) and 512K bytes (the 520ST). Although 128K is fine for most applications, 512K is better if you're considering developing your own software.

But what good would a computer be if it wasn't able to talk to the outside world? The ST has been designed to interface with the outside world in several ways.

The system has a built-in floppy disk controller and interface (Photo 1), which easily connects to 3½-inch semi-rigid floppy ("stiffy"?) drives. These drives can store up to 1 megabyte on a disk.

A high-speed hard disk interface is also standard on the ST (Photo 1). This allows connection to hard disk drives, high-speed mass storage devices. Typical hard disk drives start with 10 megabytes of memory and go up from there. The ST's hard disk interface allows data transfer at speeds up to 1.3 megabytes per second to and from the disk. I'm hoping that the hard disk interface can also be connected to other I/O devices, such as ultra-high-resolution graphics "frame buffers."

The ST computers have three separate video outputs (Photo 1): an RF modulator for normal black-and-white or color TV; composite and RGB color monitor outputs; and extra-high-resolution monochrome display outputs.

Even though the ST will work fine on ordinary TV sets in its low-resolution color mode, I feel that a good color monitor is a "must" for it—otherwise, you waste a good deal of its potential.

The ST has an RS-232 serial communications port (Photo 1), enabling you to connect modems, digitizing tablets, plotters, printers and other RS-232 standard equipment. More on the RS-232 port later.

There's a Centronics parallel printer port on the ST (Photo 1), so you can easily connect all types of printers to the computer.

A MIDI (Musical Instrument Digital Interface) is provided (Photo 1), so that those who are so inclined can connect musical instruments, such as electronic synthesizers, to the ST.

A cartridge slot on the left side of the ST (Photo 2) allows you to connect car-

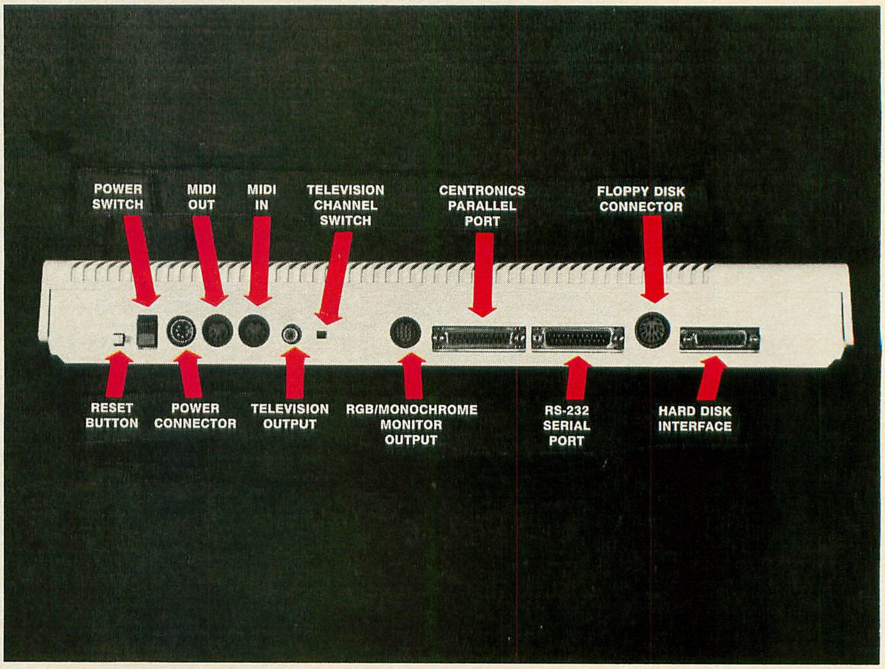


**Photo 1.**

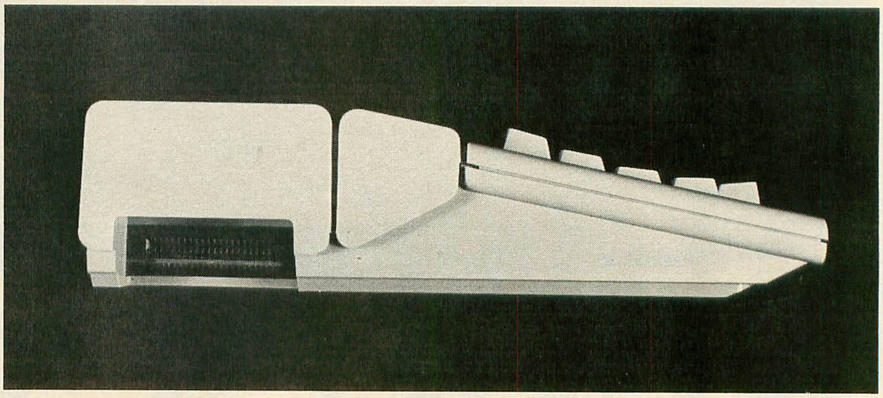

**Photo 2.**

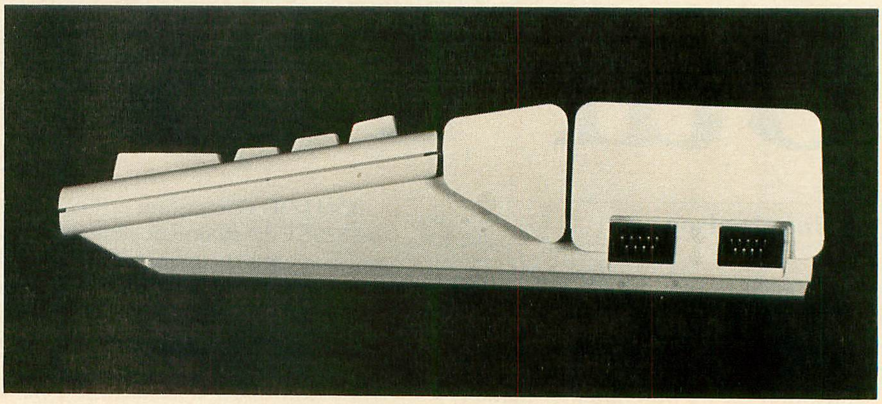

**Photo 3.**

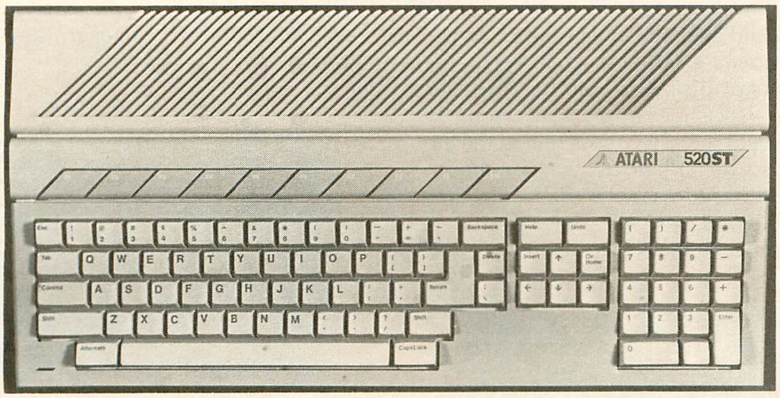


**Photo 4.**

tridges with up to 128K of memory for fast-running programs.

The ST has two joystick ports on the right side (Photo 3) for input with standard joysticks. One of the ports doubles as a mouse input port, allowing the use of a two-button mouse, the new standard input device which lets you point to various choices on your screen.

Finally, as far as its hardware is concerned, the ST has a sophisticated, microprocessor-controlled keyboard with a 58-key typewriter-style format, 8-key cursor control cluster, 18-key numeric keypad and 10-key function key strip. Since the keyboard has its own microprocessor, it can be programmed to perform a variety of special functions.

I've mentioned all the hardware interfaces that are standard equipment on the ST, but what about the most important interface? What about the USER interface?

### A real GEM.

The real star of the ST show is GEM (a registered trademark of Digital Research, Inc.), the Graphics Environment Manager from Digital Research—the same folks who brought the microcomputer world CP/M, a standard among micro systems. I feel that GEM is destined to be a new standard for micros, something that is badly needed in today's ever-changing computer industry.

Why do I feel that GEM is going to be a new standard? Because, in a matter of hours, both Charles Bachand and I felt completely comfortable with the GEM user interface, and I was writing pro-


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grams that utilized GEM's built-in functions the next day.

As the advertising agency for Apple Computer put it in an ad for the Macintosh, people don't want to read stacks of documentation in order to use a computer. The computer should be designed so that they can sit down in front of it and use it right away. That's what the Macintosh does. . . and so does the ST.

The ST isn't the only computer that will utilize GEM, either. GEM is already being implemented on IBM, Commodore and other computers. This, if anything, is a positive sign for ST users. GEM is designed so that programs that run on one GEM-based machine can be easily ported to another machine with GEM. If a company writes a GEM application for the IBM PC, it can quickly be converted to run on the Atari ST, and vice versa.

You're going to hear GEM being compared to the Macintosh user interface very often, and with good reason. They are functionally very similar. Both make it easy for the first-time computer user to operate complex software. Both are graphically oriented. Both use mice to point to user selections. But the ST, with its GEM interface, costs much less than a comparably featured Macintosh. In addition, GEM operates in full color on the ST, an added dimension which I enjoy.

### Using the ST.

The ST is designed for ease of use and (dare I say it?) user-friendliness. One feature most people will appreciate is that GEM itself is built into the ST, in 192K of ROM (Read-Only Memory).

This may not mean much by itself, but *this* will: when you turn on the ST, the GEM "desktop" screen (Photo 5) appears in about 3½ seconds! Compare this to the approximately 9 seconds required to boot an 8-bit Atari computer into BASIC. When you're in a hurry to get computing, I think you'll appreciate the fact that the ST doesn't have to load 192K of memory on power-up.

As you can see in Photo 5, GEM will show us what devices are currently attached to our ST. On the right side of the screen, you can see file cabinet icons representing the two floppy disk drives. These have respective identities of A and B. Below them, in the lower right-hand corner, is the TRASH icon. This icon is used to dispose of unwanted items.

Let's say we want to see what's on disk A. Using the mouse to move the screen pointer, we merely point to the icon for disk A and click the mouse button twice. GEM opens a window to show us the contents of disk A (Photo 6). The files on the disk show up as icons, too. By pointing to the VIEW selection at the top of the screen (Photo 7), we can choose how we want to see the files—as icons or text—and can sort them by name, creation date, size or type.

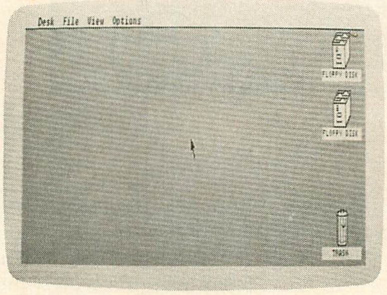

**Photo 5.**

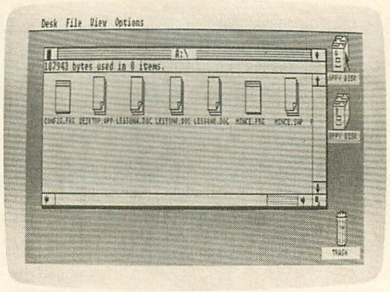

**Photo 6.**

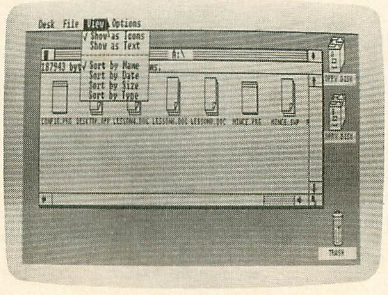

**Photo 7.**

If we choose to show the items as text and sort them by name, as shown in Photo 8, we can see more information about the file than if we used the icon option. For example, you can see that the file MINCE.PRG uses 40960 bytes. The creation date and time weren't set when we saved the file, so they're not valid. GEM does save this information, however, so it's there if you ever want to use it.

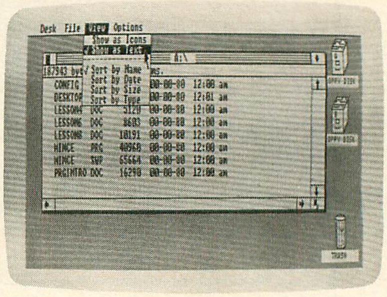

**Photo 8.**

What if we want to see what's on disk B at the same time that we've got disk A open? No problem—we simply click twice while pointing to the disk B icon, and *voila!* GEM opens a window showing the contents of disk B, as you can see in Photo 9.

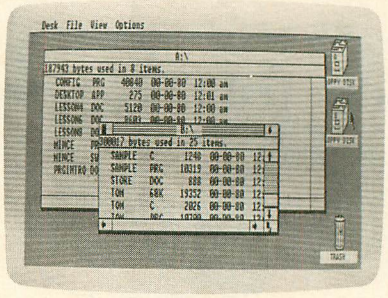

**Photo 9.**

GEM allows almost any manipulation of a window that you can think of. You can move them around on the screen, make them larger or smaller, and so on. If you make a window so small that not all of the files can be seen in it, you can use the side and bottom control strips on the window to "move" the files under the window. Up to four windows can be open in the GEM Desktop's current version.

You can pick up icons and move them around on the GEM, using the mouse. If you don't like where GEM initially placed your DISK and TRASH icons, you can move them to a place of your choice. You can save the GEM Desktop —icons, windows and all—to disk at any time.

To copy a file from disk A to disk B, simply pick up the icon in the disk A window and move it to either the disk B icon or the disk B window! To delete a file or files, just select them with the mouse and drag the icon(s) to the trash can, where they'll disappear forever. All operations involving copying or deleting of files will cause GEM to ask for confirmation before the action is taken.

GEM's flexibility allows you to combine several related files into a "folder" for easy manipulation. These folders can then be called up as separate windows and treated as mini disk directories.

I'm sure I haven't seen all the great things that GEM can do—it's so flexible that I'm finding new options just about every day. From what I've seen so far, GEM is a real jewel.

### First uses.

When we received the development system, it included the 520ST computer, a 13-inch RGB monitor, a 500K 3½-inch floppy disk, a 1MB 3½-inch floppy disk, 3 diskettes, and around 4000 pages of documentation on GEM, CP/M 68K and other technical subjects.

We had the machine hooked up and operating in record time, played around with the GEM Desktop for a while, then backed up the system diskettes. During this time, we explored the many capabilities of GEM and became fairly adept at file manipulations.

A short set of instructions was included to help us compile and execute a C program called CLIPR. It demonstrates the use of GEM by a C program, plus an important graphics functions known as "clipping." The program was written in the CP/M 68K C language, an integer-only version of C, a widely-used software development language. We prepared our disks for the compile and, after a couple of false starts (write-protected disks!), had the program running.

"Ah hah!" I said, "now I'm gonna try writing something myself!" I loaded the GEM Desktop and searched the disks for a text editor program. None were to be found. Disappointed that I had an ultra-fast machine in front of me begging to be programmed and had no editor, I began to examine my options.

Included in the ST software we received was KERMIT, a telecommunications program which allowed file transfers between computers. Remembering that a version of KERMIT was available on CompuServe, I called the service and downloaded the Atari 800 version. A quick trip to Radio Shack for supplies, a little soldering, and I had an interface cable to connect my 800 to the ST.

The KERMIT programs were started up, and the computers were talking! (I must admit, I felt like Dr. Charles Forbin in *Colossus: The Forbin Project*, as he watched the American defense computer, Colossus, talking to the Russian defense computer, Guardian.)

For the next few hours, I busily typed in some C code, following the rules set forth in the GEM Programmer's Guide for proper function calls. Using KERMIT, the C source code was sent from the 800 to the ST at 9600 baud. The ST was then used to compile and link the code into an executable 68000 file. The result? A colorful pie chart, shown on the title page of this article. Want to see how it was done? Read on!

### Easy as pie.

I was truly surprised to find how easy the GEM function calls were to use. Inside the ST are hundreds of functions enabling one to draw shapes, text, pie charts, bar graphs and other graphics. Another set of functions allows use of windows, drop-down menus and icons.

These functions may be called by the programmer through any language that has been set up to reference the GEM routines. In our development system, only C 68K and 68000 Assembly language can be used, though more languages, such as BASIC, Logo and others will surely follow.

Since my 68000 background is somewhat limited, I chose to write my pie chart demonstration in C, which can be picked up by most programmers fairly quickly. For those of you not familiar with C, the Action! language popular on Atari's 8-bit computers is similar to its structure.

To start a GEM application, you must open the application's "workstation." This is essentially the equivalent of executing a GRAPHICS call on the Atari 8-bit machines. It sets up basic parameters used by GEM, like line type, color, fill type (solid, crosshatched, etc.), and so on.

After the workstation is open, you're ready to start processing. For the pie chart graph, I set the background color to black. This is accomplished by setting the red, green and blue color levels for the background to 0. The ST has eight levels available for each color, for a total color palette of 8*8*8 (or 512) colors. This "set color" command is executed with the C statements shown in Figure 1.

```
rgb_in[0] = 0;
rgb_in[1] = 0;
rgb_in[2] = 0;
index = 0;
vs_color(handle, index, rgb_in);
```

**Figure 1.**

The rgb_in array contains the levels of red (rgb_in[0]), green (rgb_in[1]) and blue (rgb_in[2]). The variable "index" tells which color register to set (in this case, register 0), or the background. The ST has sixteen color registers in its low-resolution mode (320 x 200 pixels), which is what the pie chart uses.

The call to vs_color tells GEM to actually set the color. The "handle" variable used in the call is a unique identifier that's set when the screen is opened. It tells GEM that the color command is to be applied to the screen.

The white background grid was created with a series of FOR-NEXT-type loops and the GEM line-drawing function. It's very easy to use and straightforward.

To draw the pie chart itself, I used the built-in "elliptical pie" commands of GEM. First the gray shadow was drawn, then the pie wedges themselves, in four different colors.

The green segment, for example, extends from 30 to 140 degrees, has its center at the screen coordinate 140X, 135Y, and is part of an elliptical pie with an X radius of 120 and a Y radius of 40. These parameters are passed to GEM as shown in Figure 2.

GEM takes care of drawing and filling the entire pie segment for you, in whatever fill style you like (I chose to have it filled with a solid color).

Note that the pie segment angle is passed to GEM in tenths of degrees for accuracy (e.g., 30 degrees = 300 units for the pie chart call). Now, isn't that easy to use?

Finally, the chart was labeled with color-coordinated text. GEM's text display function is quite flexible, enabling several text special effects, in any font you like. To plot the "Business" label for the green pie segment, I simply set the text color to green and plotted the text at the appropriate X and Y coordinate, as shown in Figure 3.

In months to come, **ANALOG Computing** will be presenting full program listings for the ST computers. I realize this information is sketchy, but I just wanted to give everyone a "feel" for the power that the GEM system provides. I'm really sold on the GEM interface. I feel it gives a new dimension to personal computers. The ease of programming for GEM insures that there will be a great deal of software available for the ST.

```
x = 140;
y = 135;
begang = 300;
endang = 1400;
xradius = 120;
yradius = 40;
v_ellpie(handle, x, y, xradius, yradius, begang, endang);
```

Figure 2.

```
x = 20;
y = 47;
v_gtext(handle, x, y, "Business");
```

Figure 3.

### My view of the ST.

If properly marketed by Atari, the ST will be a major factor in the personal computer market for the next few years. The sheer power of the 68000 microprocessor, combined with the easy-to-use GEM user interface and Atari's low price makes the ST a machine I can't pass up. People have asked me if the ST "really exists." It certainly does—and it works as advertised.

Many readers have asked us if their old software will run on the ST. For machine language bootable disks and cassettes, the answer is no. The 68000 processor is completely different from the 8-bit 6502, and running 6502 programs on the ST is simply not possible without major rewriting.

It will be possible—quite easy, in fact—to transfer files from an 8-bit machine to the ST. I did it with the KERMIT program when I wrote the pie chart demo. With slight modification, most BASIC programs that do not rely heavily on the 8-bit machines' graphics abilities can be transported to the ST as soon as a BASIC language is available.

You'll be able to connect the ST to existing bulletin board systems, CompuServe and **ANALOG Computing**'s **TCS**, just as soon as a terminal package is released. You can bet that these telecommunications systems will set up SIGs (Special Interest Groups) for ST computer users, with dedicated ST programs and other files.

What will the ST be capable of? Just about anything you want it to do. Graphics and CAD (Computer-Aided Design) programs, business applications, educational software and, of course, games will be available soon. I don't see the ST as a game machine, since it wasn't designed with all the game graphics niceties (like player/missile graphics) of the earlier 8-bit machines.

Games will certainly be possible, but I would rather see the ST become accepted as the fantastic general-purpose graphics machine that it is. Atari's reputation in the past has been as a "game machine" company, and that's a pity. We all know how powerful the Atari 8-bit machines are, but the world has dismissed them as toys.

Well, the world is about to find out just what an Atari computer can *really* do. □


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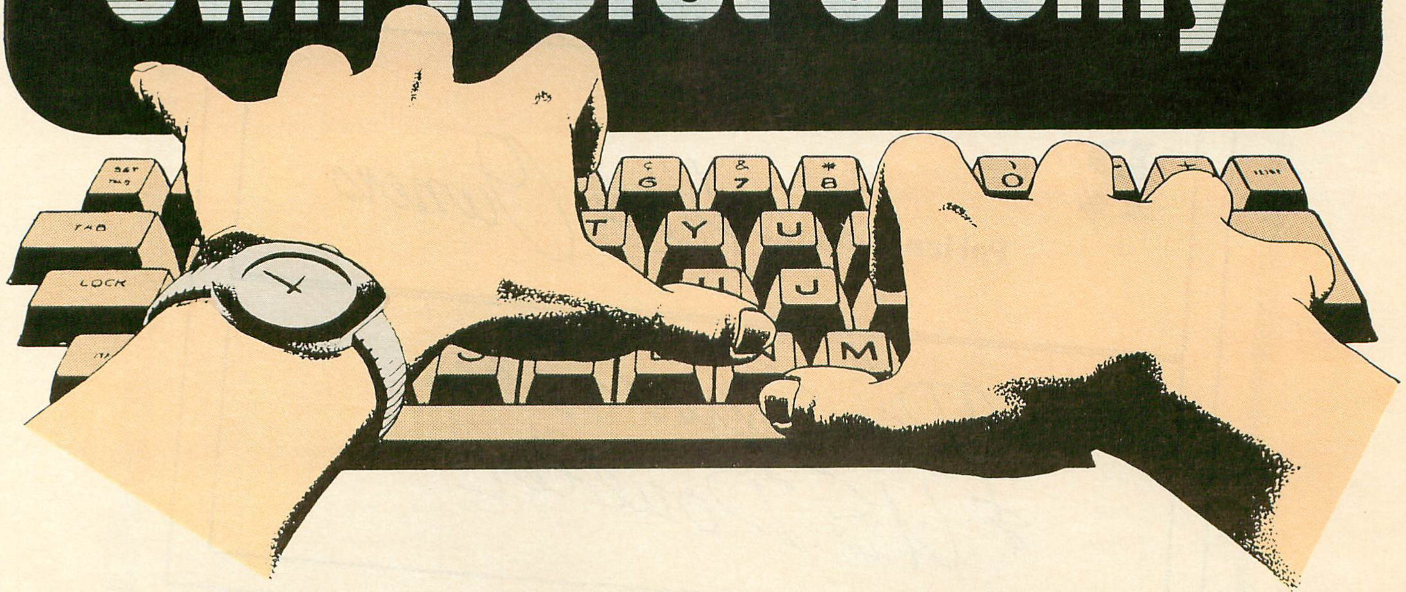
# Programming as if you're your own worst enemy



**by Jim Dunion**

Actually, I'm a bit embarrassed about writing this article. I had to sort of ease up to the keyboard sideways to even get started. Why? Well you see, this article is about programming style and how to develop a system of programming that will allow you to write programs more easily and quickly. Ah, there's the rub. . . because I have to admit that I have never, ever, *ever* finished a program on time. Never.

If there's any deadline in sight, I'll miss it. Out of sheer desperation these days, I invoke Dunion's Doodle Factor. Namely, I figure out exactly how long I think it will take to finish a program—then multiply by three. That way I usually only miss the deadline by a couple of weeks or so.

Now why is this? Bad luck, karma, the Gods of the Programming universe are against me? Maybe so. Late one evening (very late), I even wrote a poem to try to appease whichever spirit I was offending.

WHY? Because the —

Simple program wasn't
Variables didn't
Constants weren't
Sufficient time was insufficient
ROMs rammed
RAMs rommed
Debuggers had to be
User protection didn't
and the programmer did.

I finally came to realize that, when it comes to programming, I'm my own worst enemy.

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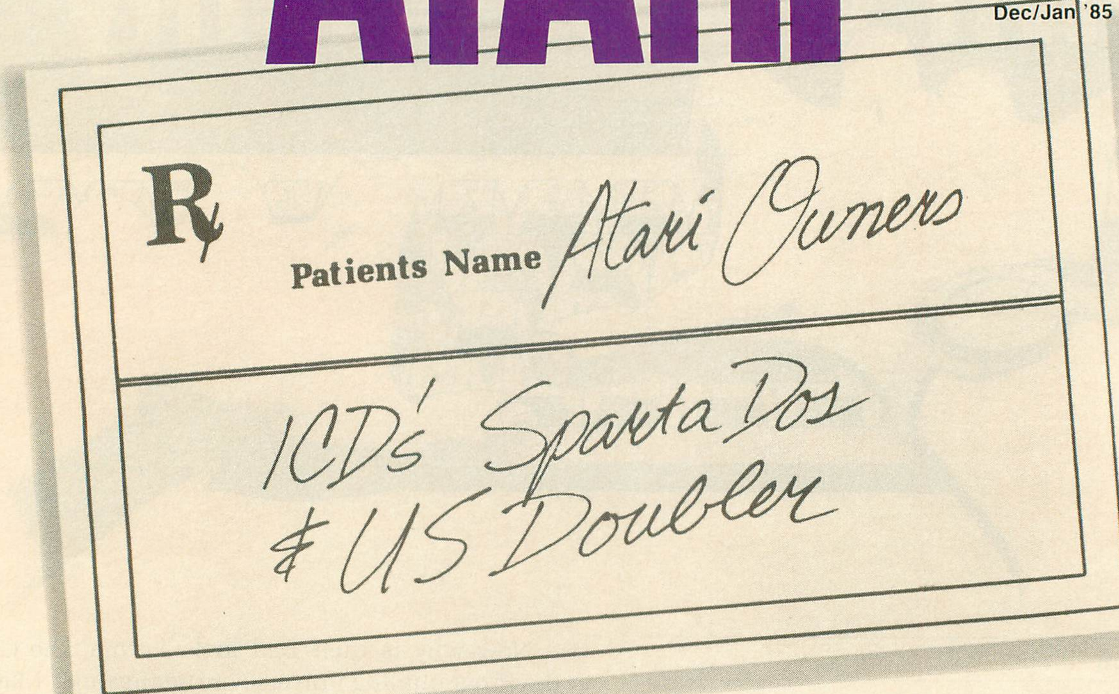
- Peter Ellison
ROM Magazine
Dec/Jan '85

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Hey, don't get me wrong! I have some great ideas. But great ideas are easy; it's working programs that are tough. And I'm lazy—I like to read, drink beer, watch the Atlanta Braves on TV, converse with anyone around. These things, as you may have learned, don't make for good, timely programs. So what to do? Read on my children, and you shall see, of the midnight schemes of Jimmy D.

**Part 1**
**The program skeleton.**

The first part of this scheme started evolving quite a while ago. Back in 1975, three friends and I started the third computer store in the country, The Computer System Center in Atlanta, Georgia. Today the remnants of that are known as Peachtree Software. Back then, all we had were the Altair 8800 and Microsoft's first BASIC. I think it was Ron Roberts who really came up with the idea of a program skeleton first.

We had started to develop our first series of business oriented software. Several of us were working on five or six programs that were always changing. Questions arose. How do we keep track of the current state of each program? How do we each take advantage of the work one of the others is doing? How can we solve each problem we deal with once and once only? How can we make our system of programming evolve?

Ah, now we were starting to ask the right questions. Let's look at nature, at human beings. How has evolution worked? One key factor seems to be: once something works, stay with it! Build on it and reuse it. Look at the universality of the DNA code. Look at how every mammal is composed of cells that compose organs that compose systems that are organized around skeletons. Look at how each generation passes on to the next something of what they've learned. Do these ideas have any analogies in programming? You bet your bones!

Back to BASIC for a minute. All our programs were written (originally) in Microsoft BASIC. A BASIC

*(continued on next page)*


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CIRCLE #127 ON READER SERVICE CARD

program is essentially a series of commands. Each command had a line number, 0-32767.

Brilliant Idea #1: Consider the range of line numbers 0-32767 to be a skeleton (i.e., reserve certain of these numbers for the *same functions in every program*. Thus we had the essential program skeleton.

Each of our programs now had a similar look. Comments were in the same line number ranges. Initializations were always handled in the same line number ranges. Screen displays were in identical ranges. Input and output routines were. . . I think you get the idea. After we started laying our programs out like this, they all had a sense of familiarity to them.

Any time I picked up a program, I knew, in general, where things were going to be. I had a map. Also, I didn't have to worry about program layout each time I began writing a program. To start, I'd just take the latest version of the program skeleton and begin putting flesh on the bones. Bang! Instant evolution.

As we learned more about Microsoft BASIC and our own programming needs, our skeleton evolved. New programmers could pick up the skeleton and, using it, have the advantage of our hard-won wisdom almost immediately.

So, when I started writing programs on the Atari in their version of BASIC, guess what my first task was?

### Part 2
### An Atari BASIC program skeleton.

Let's get down to specifics—how to build into a BASIC language skeleton some of our knowledge about Atari BASIC.

There's a fundamental law of computer science that states: if time and memory are not considered, then any computer can do anything that any other computer can do. So our Ataris are as powerful as the new Japanese fifth-generation computers, right? Yeah, sort of.

Unfortunately, time and memory are usually of utmost consequence. The task of programmers doing fairly large jobs is to cram more program into less space—and to have it run faster. The tradeoffs between time and memory come up again and again.

For example, consider program documentation. I've always been of the "real programmers don't document their code" school. It slows me down, gets in the way of the creative process. What hogwash! I wish I had a dollar for every time I've said, "Hey, I don't need to document this. I *can't* forget what it does." Come next week, however. . . Out of desperation, I started lavishly commenting in my programs until I got an *ERROR-2* (memory insufficient).

Brilliant Idea #2: Develop a mechanism to make comments easily removable if program space becomes critical. Thus, my skeleton's first rule became: begin all subroutines on an even line number like 600, but begin the actual executable code at 605. Lines 600-604 are reserved for comments.

When I call the routine, I use a GOSUB 605 statement. That way, if space becomes critical, I can take out the comments (delete Lines 600-604), and the program itself will be unaffected.

Since I'm lazy, I actually wrote a program that will go through and strip off the comments, creating two files: a program file and a comment file. Here's the subroutine at 600 in my skeleton.

```
600 REM *** DELAY ***  THIS IS A
601 REM GENERAL DELAY SUBROUTINE
602 REM CALLED WITH ONE PARAMETER
603 REM PAUSE = AMOUNT OF DELAY
604 REM
605 FOR DELAY=Z0 TO PAUSE:NEXT DELAY:R
ETURN
```


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CIRCLE #128 ON READER SERVICE CARD

"What's that *Z0*?" I hope you're asking. Hold on, we'll get there next.

One clammy day, while trying to wring a few bytes from a program, I ran Lane Winner's XREF, to see how many times I used each variable and constant. I found a lot of numbers like *0,1,2,3,4,5,6,7,8,9,10,16, 128,256* over and over.

Question: how many bytes does it take to represent each numeric constant in a program? Answer: 7. But if I define a variable called *Z0 = 0*, how many bytes would it take to represent the same value in a program? Answer: 1!

Brilliant Idea #3: Why not represent all the numeric constants used a lot as variables Z0,Z1,Z2, and so forth? Look at Line 32005 of the skeleton;

```
32005 RESTORE 32605:READ Z0,Z1,Z2,Z3,Z
4,Z5,Z6,Z7,Z8,Z9,Z10,Z11,Z12,Z13,Z14,Z
15,Z16,Z255,Z256
```

•

```
32600 REM *** DATA INITIALIZATION ***
32601 REM THESE ARE INITIAL DATA
32602 REM VALUES USED IN SETTING UP
32603 REM FOR PROGRAM EXECUTION
32604 REM
32605 DATA 0,1,2,3,4,5,6,7,8,9,10,11,1
2,13,14,15,16,255,256
```

You won't believe how much memory that saves in a program. It also saves by defining these system constants via a READ statement, rather than *Z0 = 0: Z1 = 1*, and so forth.

So why did I put those statements in the 32000 range? Question: when BASIC executes a GOTO or a GOSUB statement, how does it find out where to really go to? Answer: it looks through the program from the beginning, line by line, until it finds the one it's looking for.

Brilliant Idea #4: Put all those statements needed once or very seldom at the end of the program, with the frequently used ones at the very beginning of the program.

Okay, I admit I fudged a little there. I reserve Lines 0-9 for comments about each particular program. Line 10 is then GOTO 32005. I reserve 11-999 for general skeleton routines. The program itself starts at Line 1000 (heh, heh, heh; actually 1005). Why don't I just show you the overall skeleton?

### Overall BASIC Program Skeleton.

| Line | Function Range |
|---|---|
| **0-9** | Overall program comments. |
| **10** | GOTO initialization. |
| **130-599** | Keyboard input routines. |
| **600-605** | General delay routine. |
| **1000-1999** | Main program body. |
| **2000-9999** | Program subroutines. |
| **10000-10999** | Program specific data. |
| **11000-15999** | Graphic subroutines. |
| **16000-16999** | Joystick cursor and player/missile subroutines. |
| **17000-19999** | Disk input/output routines. |
| **20000-29999** | Sound effects routines. |
| **30000-31999** | Opening screen display and special effects. |
| **32000-32767** | Initialization. |

There are other routines that come and go, but these are the ones that have hung around from program to program.

### Part 3
### The link to machine language.

Many times I've found myself involved in an argument about which is the best language to program in. BASIC, FORTRAN, ALGO, APL, LISP, LOGO,

*(continued on next page)*

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CIRCLE #129 ON READER SERVICE CARD

PROLOG, SMALLTALK, Assembly—personally, I hate 'em all. To the horror of many of my learned computer science colleagues, I still write mostly in a hybrid of BASIC with machine language subroutines.

Why BASIC? Because it's there, it's easy, and I'm lazy. There are, indeed, some problems with BASIC, particularly if you're doing graphics, special effects or anything that has to work in real time. BASIC is slow. I mean *slooooow.*

Brilliant Idea #5: Every time I need a particular function to work in real time, I program it in assembly language and link it to my BASIC skeleton. After all, with the USR function, we can call a machine language routine anywhere in memory.

So I'll simply start evolving a package of machine language routines that I call from BASIC—routines to draw boxes on the screen, move player/missiles, etc. Great idea. Except, of course, for the fact that every time I reassemble the machine language package, the absolute locations of the routines change, and I have to change the values in the USR calls to match. Can't we figure out a way around this?

Brilliant Idea #6: What I'll do is build my machine language package as a series of logical subroutines whose order never changes. For instance, machine language routine #0 is DISKIO, which handles disk input and output; machine language routine #12 draws a box on the screen, and so on.

Next, I write one routine in assembly language called LINK. It's job is to know where every other routine is actually located. Then, for instance, from BASIC to draw a box, I would write:

```
A=USR(LINK,Z12,XPOSITION,YPOSITION,XSI
ZE,YSIZE,BOXCOLOR)
```

where XPOSITION, YPOSITION, XSIZE, YSIZE, and BOXCOLOR are the specifics of where, how big and what color to draw the box. Z12 tells LINK which logical routine I want it to execute. LINK is the location of the machine language package—and this is *the only value I would need to change, no matter how much I diddled around with the assembly language code.*

```
; THIS ROUTINE IS THE LINK
; FROM BASIC PROGRAMS
;
LINK     PLA
         TAX              ;GET # OF PARAMS IN X
         PLA              ;LOGICAL # OF SUBROUTINE
         PLA              ;8 BITS ONLY
         STA JMPTAB
         LDY #Ø
LNKTST   DEX              ;-1 FOR SUBROUTINE #
         BEQ SETROU       ;IF NO PARAMETERS
         PLA
         STA PARTAB,Y     ;TO PARAMETER TABLE
         INY
         PLA
         STA PARTAB,Y     ;EACH PARAM IS 16 BITS
         INY
         BNE LNKTST       ;** ALWAYS TRUE
;
SETROU   LDA JMPTAB       ;GET # OF ROUTINE
         ASL A            ;DOUBLE
         TAY              ;USE THIS AS INDEX
         LDA SUBTAB,Y     ;GET ROUTINE ADDRESS
         STA JMPTAB
         LDA SUBTAB+1,Y
         STA JMPTAB+1
         JMP (JMPTAB)
;
JMPTAB   .DS 2
PARTAB   .DS 2Ø
;
SUBTAB   .WORD DISKIO,SBORD,CUROFF,REVERS
         .WORD PMINIT,CRHAIR,CROSS
```

Each routine I would call knows how many parameters are needed and in what order they'll be in the parameter table. Pretty simple, all in all. I like that. Solve it once and then forget about it.

## Part 4
### The machine language package in memory.

Still, there was the problem of how to get the machine language package in memory in the first place. And frankly, I even got tired of going in and changing the LINK value.

Question: is there a way I could let the computer do this for me? Answer: ever hear of a file called AUTORUN.SYS? Boy, you mean all I have to do is rename my machine package AUTORUN.SYS, and


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CIRCLE #130 ON READER SERVICE CARD

DOS will automatically load it for me at power-up time? Golly, while I'm doing that, why don't I reserve two bytes in page 6 where I'll place the current value of LINK? In the assembly language package there are a couple of statements like:

```
MACHLB    =    $0692
;
          .ORG MACHLB
          .WORD LINK
```

Then in the BASIC skeleton initialization code, I say:

```
32230 LINK=PEEK(1682)+Z256*PEEK(1683)
```

*Bingo!* Now I can change either the BASIC skeleton or the machine language package relatively independently. Who says southern boys are dumb? Slow and lazy, maybe; dumb, no. □

---

*Jim Dunion has worked with computers in a variety of ways: retailing, writing, using micros in energy education exhibits, lecturing on the 800, researching at Atari in Alan Kay's group, and spending nearly a year at Esalen Institute. He's now working with the Pacific Science Center in Seattle.*


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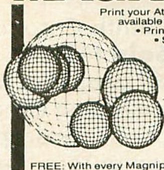

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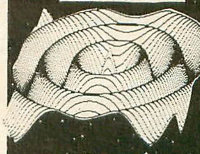

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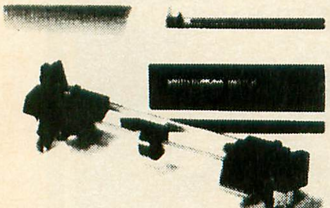

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Print Buffer Size: 132 Bytes (1 line)
No. of Char. in Char. Set: 96 ASCII & International
Graphics Capability: Standard 60, 72 Dots Per Inch Horizontal, 72 Dots Per Inch Vertical
Pitch: 10, 12, 16.7, 5, 6, 8.3
Printing Method: Impact Dot Matrix
Char. Matrix Size: (Standard) 9H x 8V, (Elongate) 10H x 8V
Printing Features: Bi-directional, Short line seeking
Printing Speed: 80 CPS

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Forms Type: Fanfold, Cut Sheet
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### RIBBON

Type: Cassette — Fabric inked ribbon
Life: 1 million characters

### CHARACTER MODE

Character Font: 9 x 8 Standard, 10 x 8 Elongated, No. 8 pin to be used for underline
Character Set: 96 ASCII, 11 x 7 International Char.
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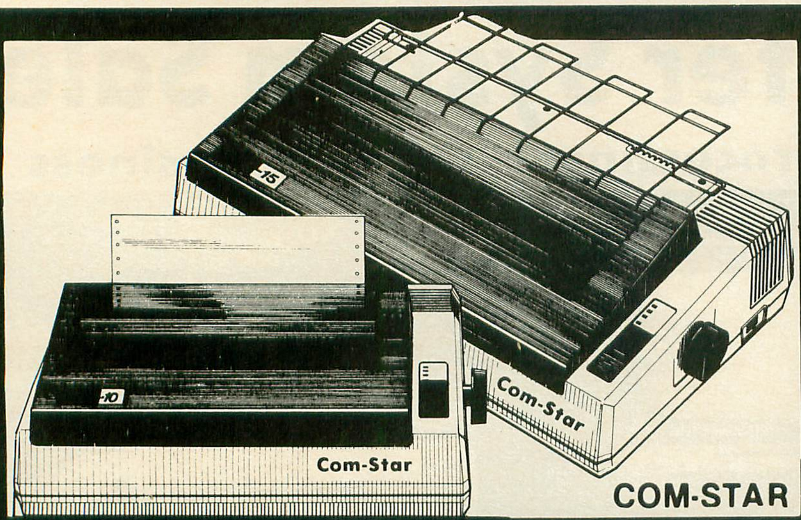


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**by Bob Curtin**

A while back I proclaimed, with my usual arrogance, that war games which feature high-res gameboard graphics often suffer from terminal simplicity. (My mother swears I stated, with the same impertinence, that kids don't develop a personality until they're at least three years old.) Times change. We grow.

**War in Russia** not only sports a high resolution, full color and a scrolling map, but is also one of those games I could only dream about ten years back, when computer war games took the form of the tank game in the then-new Atari 2600.

**WIR** is based on Operation Barbarossa, the German invasion of the Soviet Union in June of 1941, and includes scenarios which cover the battles of Stalingrad and Kursk. The three scenarios have a long and short version, which, in essence, gives you six games in the box. More than that, **WIR** can be played solitaire, or you may oppose another human. There are also four difficulty levels in the single mode, which add still more flexibility to the game.

Editor permitting, I'd like to give you some background information, simply to help you grasp the scope of **War in Russia**. Back in 1972, I bought a game entitled **War in the East**, published by a since-belly-up company called Simulations Publications, Inc. As you've no doubt guessed, the game was a simulation of Operation Barbarossa.

What's interesting is that **War in the East** was also a divisional level game, but it was played on a 4x5 foot game board and involved thousands of playing pieces. A typical game lasted 60 to 80 hours. Assimilating the rules was no picnic, either. The second edition of the game offered a 36-page rule book, as well as another, slightly smaller "system rule book."

**War in the East** could be combined with its sister game, **War in the West**, to create a behemoth of a game that covered the entire European and American theaters. To say the game was a bit ungainly would add a new dimension to the art of the understatement. However, **War in the East** was a game which simulated the problems faced by commanders (on several levels and on both sides) to a remarkably accurate degree.

**War in Russia** is essentially a computer version of **War in the East** (though I very much doubt that Gary Grigsby, the game's designer, is aware of that) and, although the map is scaled down and the units set to a manageable size, **WIR** has all of the same features plus a few of its own to sweeten the pot.

It's a *big* game; make no mistake about that. The box copy touts, "You're holding the result of two years' efforts to create the definitive simulation of the war in Russia, 1941-1944." The campaign game takes a whopping 100 hours to complete!

Playing the game well requires a firm grasp of the job to be done, a semblance of an overall strategy, tactical excellence and attention to detail. (Certainly, these things can be learned by doing.)

Although I don't want to get too heavily into the mechanics of the game, the following will outline the general structure. **WIR** proceeds through seven separate phases, each with one or more subphrases. As complex as it sounds, the computer does most of the work and leaves the player(s) to attend to tactics and strategy instead of bookkeeping.

Not to say there isn't a lot to be done; there is. But the computer does all of the math in the game, all of the looking up of combat odds and modifiers, all of the rules checking (it's impossible to make an illegal move), and forces the game into an orderly, step-by-step affair which is—if you're into cerebral gaming—easy and fun to play.

*You're holding the result of two years' efforts to create the definitive simulation of the war in Russia, 1941-1944.*

**WIR** uses the usual "zone-of-control" concept, that is, a unit exerts a zone of control into the six adjacent hexes. This ZOC has a variety of effects on movement, combat and supply, and makes possible those huge enveloping actions so common at the beginning of this campaign.

Logistics play a crucial part in **WIR**. Supply depots have to move to within two hexes of the units they're to supply, and neither the two-hex supply route nor the depot itself may enter an enemy zone of control.

Units which can't be supplied suffer a variety of detrimental effects, including loss of combat effectiveness, loss of or impeded movement, and a lack of artillery. Air strikes also must be supplied to be allocated.

## REVIEW

All movement is handled through the keyboard, and there are several different categories of movement.

Tactical movement is plotted ahead of time and executed during the combat phase. Under certain conditions (the criteria change during the game), the player sequence may change. At the beginning of the game, odds are overwhelming that the Axis player will be the "first player" during the combat phase, but as the war progresses, the odds become better that the Soviets will take the initiative.

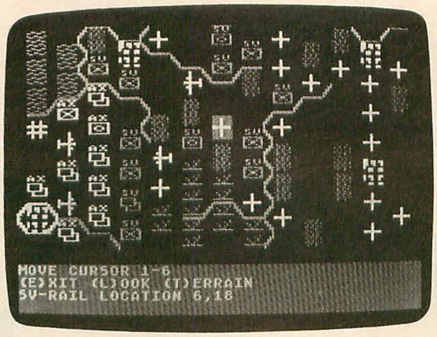
Strategic movement is designed to get units around behind the lines and/or move new units up to the front quickly. Although it's faster than tactical movement, strategic movement is also severely restricted. Rail movement is another limited option open to each player.

Some of the other features in **WIR** are: variable weather conditions, unit experience (unit effectiveness increases with combat experience and decreases with replacements), partisans, lend lease, building rail nets, artillery, and fatigue.

Units which have not moved in any manner during the previous turn will automatically attempt to increase their entrenchment level. High entrenchment levels increase defense against artillery bombardment and air strikes.

Finally—but certainly *not* least of all—is the production phase of the game. All new units entering the game must be produced in "factories." There are four types of factories: heavy industry, vehicle, artillery and aircraft. A player starts the game with a number of each, and additional factories may be built as the game progresses.

This part can make or break you. Production strategy must take into account casualties, overall strategy, and the ebb and flow of the game. It becomes patently obvious (very quickly) that you can't build everything you want, that real choices have to be made, and that this aspect of **WIR** is the most difficult to master.




**War in Russia.**

No hints on production strategy are included with the game. Trial and error (and error and error) will be your tutor, but with experience comes the savvy you'll need to get through this part of the game with a modicum of efficiency.

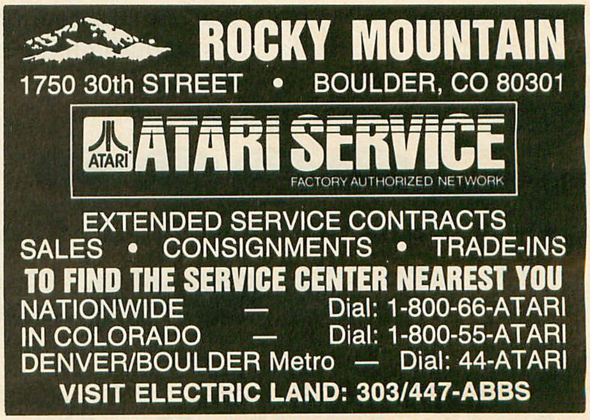
Unfortunately, there are a couple of drawbacks to **WIR**. First is the length of time it takes to play a complete game, even one of the shortest scenarios. You have to expect to spend at least twenty hours at your computer to finish a game—and much more, if you're playing with another human.

The second problem's one that applies to all computer games of this genre. Whenever you're playing against another person, there are always hours spent twiddling your thumbs while your opponent makes his or her decisions on moves. Although this doesn't exactly make for super exciting game sessions, there is a possible way around it.

**WIR** is set up so that the game can be saved after any player's phase. There is no reason why a player couldn't make his move, save the game and transfer the file through a modem to a player elsewhere. Your opponent could then restart the game with this file, make his move, save the game and ship it back to you over the phone. I haven't tried this yet, but it's something I'm looking into.

All in all, **WIR** is an excellent offering, even with its drawbacks. SSI is the premier house for computer war games, and **War in Russia** is one of the best in the house. □

*Bob Curtin is a machinist who got into computing in 1982, when he bought an Atari 800. He uses his computer for writing, programming, telecommunications, and the more cerebral games. His ambition is to write the definitive computer baseball game.*



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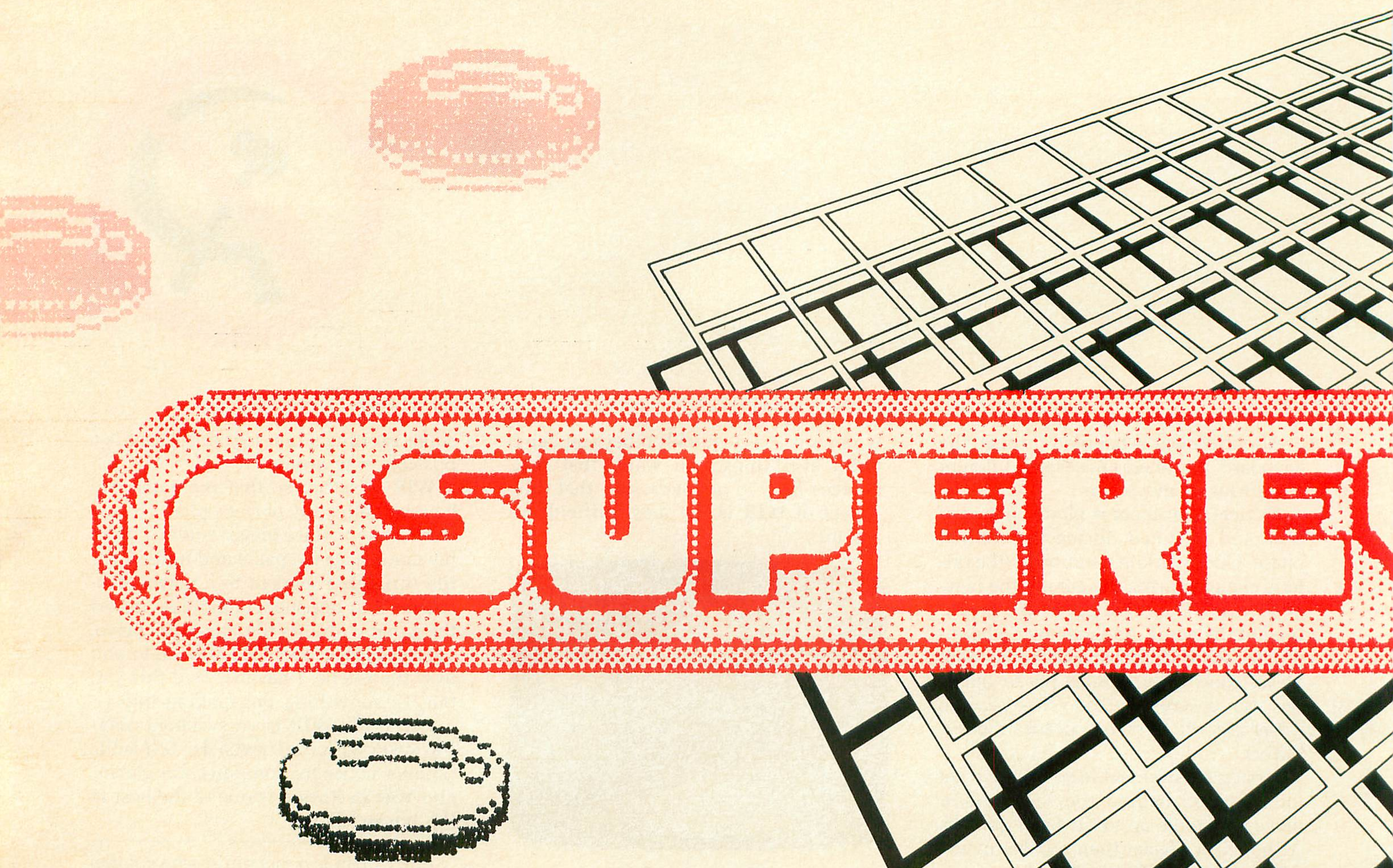


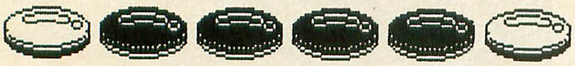

by Phillip Burgess

**Supereversion** is an Atari computer adaptation of the classic flip-the-chips game best known as Othello or Reversi. The game is played on an eight-by-eight grid, using chips which have a different color on each side. We start with two of each color in the middle of the board.

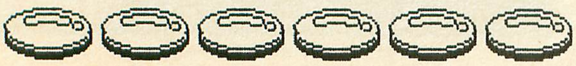
With white moving first, players alternate turns, capturing their opponent's chips by outflanking them on two sides. Here's how it works.

Suppose a row of chips looked like this:

By placing a white chip at the right end of the row,



the black chips would be reversed to white.



This example shows the chips being reversed in one direction only. Chips can actually be captured in up to eight directions, as long as there's a chip of your color at the opposite end of the row you intend to capture. After the chips are reversed to your color, they are yours and can be used in subsequent moves to gain chips.

Players must make moves that score. If you make an illegal move, such as a non-scoring move or placing one chip on top of another, the computer will emit a hideous sound to let you know that you must make a different move. If there are no possible


legal moves for you, pressing *P* will pass the move to your opponent, and you'll lose a chip from your supply of thirty. **Supereversion** continues till both players exhaust their chip supply, one player captures every chip on the board, or both players pass the move. The player with the most chips in his or her color at the end of the game is the winner.

Although a high-scoring move is the most appealing, it's usually best to make a lower-scoring move which puts your chips in a position less likely to be captured by your opponent.

Chips placed along the outside edge of the board are valuable, since they can be captured from only two directions, but can serve as an outside edge for up to five directions. A corner chip is even more valuable. It cannot be captured from any direction and will remain yours until the end of the game.

The second to edge squares, on the other hand, should be avoided. A chip placed in one of these squares could be your opponent's bridge to an outside edge position.

The computer is programmed to use these tactics in the decision of its move. However, it only thinks about the current move and doesn't plan moves in advance.

Although the computer is an excellent opponent for beginners, advanced players will find it more challenging to play against another human. If you should, however, find yourself losing to the computer, just keep in mind that the SYSTEM RESET key is always within arm's reach! □

*Currently a junior in high school, Phillip Burgess received his Atari 400 three years ago. He's primarily interested in graphics, with games and music following close behind. He hopes to find employment someday in the exciting field of computer graphics.*

*(Listing starts on next page)*

Listing 1.
BASIC listing.

```
10 REM    SUPEREVERSION
20 REM BY PHILLIP BURGESS
30 READ K1,K2,K3,K4,K5,K6,K7,K8,K10:DATA 1,2,3,4,5,6,7,8,10
40 GRAPHICS K0:POKE 752,K1:POKE 709,15:POKE 710,K0
50 POSITION K7,K3:? "INITIALIZING SUPEREVERSION"
60 POSITION K3,K7:? "RELAX, THIS TAKES ABOUT 40 SECONDS"
70 FOR I=K0 TO 750:NEXT I:FOR I=15 TO K0 STEP -0.25:POKE 709,I:NEXT I:? CHR$(125)
80 POKE 559,K0:POKE 752,K1:GOTO 860
90 POKE 711,K2:M=29
100 REM MAIN LOOP
110 FOR I=K1 TO K2:POKE 77,K0:POKE 704,K2+K10*(I=K1)
120 POSITION 17,21:? "      ":IF PASS=K2 THEN 1860
130 X1=K7*(I=K2):Y1=K7*(I=K1)
140 X=68+112*(I=K2):Y=68:Q=USR(MOVE,K0,PMB,CURSOR,X,Y,K4)
150 FOR V=K10 TO K0 STEP -K1:SOUND K0,60,K10,V:SOUND K1,29+92*(I=K2),K10,V:POKE 711,PEEK(711)+(I=K1)-(I=K2):NEXT V
160 F=K0:ON P(I)+K1 GOTO 210,450,450
170 NEXT I
180 M=M-K1:IF M<K0 THEN 1860
190 GOTO 110
200 REM COMPUTER'S TURN
210 MAX=K0:TEMPX=K0:TEMPY=K0:FOR X1=K0 TO K7:FOR Y1=K0 TO K7
220 IF GRID(X1,Y1) THEN 270
230 VA=K0:FOR D1=-K1 TO K1:FOR D2=-K1 TO K1
240 TRAP 260
250 IF GRID(X1+D1,Y1+D2)=K3-I THEN 280
260 TRAP 270:NEXT D2:NEXT D1
270 NEXT Y1:NEXT X1:X1=TEMPX:Y1=TEMPY:F=K0:GOTO 370
280 FOR A=K2 TO K7:TRAP 300:TEMP=GRID(X1+D1*A,Y1+D2*A):IF  NOT TEMP THEN 260
290 IF TEMP=I THEN 310
300 NEXT A:GOTO 260
310 VA=VA+A
320 IF X1=K0 OR X1=K7 THEN VA=VA*K4
330 IF Y1=K0 OR Y1=K7 THEN VA=VA*K4
340 IF X1=K1 OR X1=K6 OR Y1=K1 OR Y1=K6 THEN VA=VA/K6
350 IF VA>MAX OR (VA=MAX AND RND(K0)>0.5) THEN MAX=VA:TEMPX=X1:TEMPY=Y1
360 GOTO 260
370 IF  NOT MAX THEN 530
380 DESTX=124+K8*TEMPX-K8*TEMPY:DESTY=40+K4*(TEMPX+TEMPY)
390 ROT=ROT+K4:IF ROT>16 THEN ROT=K4
400 X=X+((DESTX>X)-(DESTX<X))*K2:Y=Y+(DESTY>Y)-(DESTY<Y)
410 Q=USR(MOVE,K0,PMB,CURSOR+ROT,X,Y,K4)
420 IF X=DESTX AND Y=DESTY THEN 560
430 GOTO 390
440 REM HUMAN'S TURN
450 D1=K0:D2=K0:GOTO 450+STICK(P(I)-K1)
455 IF X1<K7 THEN X1=X1+K1:D1=K1:D2=0.5:GOTO 470
456 IF Y1>K0 THEN Y1=Y1-K1:D1=K1:D2=-0.5:GOTO 470
457 IF X1<K7 AND Y1>K0 THEN X1=X1+K1:Y1=Y1-K1:D1=K2:GOTO 470
459 IF Y1<K7 THEN Y1=Y1+K1:D1=-K1:D2=0.5:GOTO 470
460 IF X1>0 THEN X1=X1-K1:D1=-K1:D2=-0.5:GOTO 470
461 IF X1>K0 AND Y1<K7 THEN X1=X1-K1:Y1=Y1+K1:D1=-K2:GOTO 470
463 IF X1<K7 AND Y1<K7 THEN X1=X1+K1:Y1=Y1+K1:D2=K1:GOTO 470
464 IF X1>K0 AND Y1>K0 THEN X1=X1-K1:Y1=Y1-K1:D2=-K1:GOTO 470
465 ROT=ROT+K4:IF ROT>16 THEN ROT=K4
466 Q=USR(MOVE,K0,PMB,CURSOR+ROT,X,Y,K4):GOTO 490
470 FOR J=K1 TO K8:X=X+D1:Y=Y+D2:ROT=ROT+K4:IF ROT>16 THEN ROT=K4
480 Q=USR(MOVE,K0,PMB,CURSOR+ROT,X,Y,K4):NEXT J
490 IF  NOT STRIG(P(I)-K1) THEN 560
500 IF PEEK(764)=K10 THEN POKE 764,255:GOTO 520
510 GOTO 450
520 Q=USR(MOVE,K0,PMB,CURSOR,X,Y,K4)
530 POSITION 17,21:? "I PASS":PASS=PASS+K1:FOR V=K8 TO K0 STEP -K1:FOR V1=V TO K0 STEP -K1
540 SOUND K0,60,K10,V1:SOUND K1,29+92*(I=K2),K10,V1:NEXT V1:NEXT V:GOTO 800
550 REM FLIP CHIPS
560 Q=USR(MOVE,K0,PMB,CURSOR,X,Y,K4):IF GRID(X1,Y1) THEN 840
570 FOR D1=-K1 TO K1:FOR D2=-K1 TO K1
580 TRAP 600
590 IF GRID(X1+D1,Y1+D2)=K3-I THEN 620
600 TRAP 610:NEXT D2:NEXT D1:IF  NOT F THEN 840
610 GOTO 800
620 FOR A=K2 TO K7:TRAP 600:TEMP=GRID(X1+D1*A,Y1+D2*A):IF  NOT TEMP THEN 600
630 IF TEMP=I THEN 650
640 NEXT A:GOTO 600
650 IF  NOT F THEN SC(K3-I)=SC(K3-I)+K1:GOSUB 720
660 IF PASS>K0 THEN PASS=PASS-K1
670 F=K1:FOR B=K1 TO A-K1
680 X1=X1+D1:Y1=Y1+D2:GOSUB 720
690 NEXT B:X1=X1-D1*(B-K1):Y1=Y1-D2*(B-K1)
700 GOTO 600
710 REM PLOTCHIPS
720 A1=19+X1+X1-Y1-Y1:B1=K4+X1+Y1:LOCATE A1,B1,Z
730 IF (Z=116 OR Z=23) AND I=K1 THEN POSITION A1,B1:? CHR$(19);CHR$(20)
740 IF (Z=117 OR Z=25) AND I=K1 THEN POSITION A1,B1:? CHR$(21);CHR$(22)
750 IF (Z=116 OR Z=19) AND I=K2 THEN POSITION A1,B1:? CHR$(23);CHR$(24)
760 IF (Z=117 OR Z=21) AND I=K2 THEN POSITION A1,B1:? CHR$(25);CHR$(26)
770 FOR V=K4 TO K0 STEP -K1:SOUND K0,60,K10,V:SOUND K1,29+92*(I=K2),K10,V:NEXT V
780 SC(I)=SC(I)+K1:SC(K3-I)=SC(K3-I)-K1:GRID(X1,Y1)=I:RETURN
790 REM PRINT SCORES + MISC. SUBS
800 POSITION K8,18:? SC(K1);" ":POSITION 36,18:? SC(K2);" "
810 POSITION K10+26*(I=K2),20:? M;" "
820 IF SC(K1)=K0 OR SC(K2)=K0 THEN 1860
830 GOTO 170
840 FOR V=15 TO K0 STEP -0.2:SOUND K0,72,K6,V:NEXT V:GOTO 450
850 REM INITIALIZATION
860 DL=PEEK(560)+PEEK(561)*256
870 POKE DL+K3,69:POKE DL+K6,K5:FOR I=K7 TO 28:POKE DL+I,K4:NEXT I
880 DIM GRID(K7,K7),P(K2),SC(K2),PL$(40)
```

```
890 PL$=" COMPUTER STICK ONE STICK TWO
 COMPUTER  "
900 DIM C$(3072):C=ADR(C$):CH=(INT(C/1
024)+K1)*K4:D=CH*256-C:POKE 756,CH
910 PMBASE=CH+K4:POKE 54279,PMBASE:PMB
=PMBASE*256:POKE 53277,K3:POKE 623,K1
920 MOVE=PMB:SPIN=MOVE+100:CURSOR=SPIN
+84:BRITE=CURSOR+20
930 FOR I=K0 TO 215:READ A:POKE MOVE+I
,A:NEXT I
940 DATA 216,104,104,104,133,213,104,2
4,105,2,133,206,104,133,205,104,133,20
4,104,133,203,104,104,133,208
950 DATA 104,104,133,209,104,104,24,10
1,209,133,207,166,213,240,16,165,205,2
4,105,128,133,205,165,206,105
960 DATA 0,133,206,202,208,240,160,0,1
62,0,196,209,144,19,196,207,176,15,132
,212,138,168,177,203,164
970 DATA 212,145,205,232,169,0,240,4,1
69,0,145,205,200,192,128,208,224,166,2
13,165,208,157,0,208,96
980 DATA 28,62,127,127,127,62,28,8,28,
62,62,62,28,8,8,8,28,28,28,8,8
990 DATA 8,8,8,8,8,8,8,8,8,28,28,28,8,
8,8,28,62,62,62,28,8
1000 DATA 28,62,127,127,127,62,28,0,28
,62,127,62,28,0,0,0,28,127,28,0,0
1010 DATA 0,0,0,127,0,0,0,0,0,28,127,2
8,0,0,0,28,62,127,62,28,0
1020 DATA 255,129,129,255,238,1,129,22
1,119,128,129,187,187,129,128,119,221,
129,1,238
1030 DATA 0,2,4,6,8,12,14,12,8,6,4,2
1040 FOR I=K0 TO 983:READ A:POKE C+D+I
,A:NEXT I
1050 DATA 0,0,0,0,0,0,0,0,12,12,12,12,
0,8,4,0,0,0,0,0,0,0,0,0
1060 DATA 0,3,15,63,255,254,250,234,0,
3,15,63,255,253,245,213,255,253,245,21
3,85,149,165,169
1070 DATA 255,254,250,234,170,106,90,8
6,255,127,95,87,85,86,90,106,255,191,1
75,171,170,169,165,149
1080 DATA 0,192,240,252,255,191,175,17
1,0,192,240,252,255,127,95,87,170,234,
250,254,255,127,95,87
1090 DATA 85,213,245,253,255,127,95,87
,170,169,165,149,85,213,245,253,85,86,
90,106,170,234,250,254
1100 DATA 0,21,42,63,42,21,0,0,12,51,5
1,51,63,42,4,0,12,60,12,12,63,42,21,0
1110 DATA 60,3,12,48,63,42,21,0,63,3,1
2,3,63,42,20,0,51,51,63,15,15,10,5,0
1120 DATA 63,48,60,3,63,42,20,0,15,48,
60,51,63,42,4,0,63,3,3,12,12,40,20,0
1130 DATA 12,51,12,51,63,42,4,0,12,51,
15,3,63,42,20,0,170,106,90,86,85,86,90
,106
1140 DATA 85,149,165,169,170,169,165,1
49,170,169,165,149,85,149,165,169,85,8
6,90,106,170,106,90,86
1150 DATA 255,127,95,87,85,21,5,1,255,
254,250,234,170,168,160,128,0,0,0,0,0,
0,0,0
1160 DATA 12,51,51,63,51,34,17,0,60,51
,60,51,63,42,20,0,15,48,48,48,63,42,5,
0
1170 DATA 60,51,51,51,63,42,20,0,63,48
,60,48,63,42,21,0,63,48,60,48,48,32,16
,0
1180 DATA 15,48,51,51,63,42,5,0,51,51,
63,51,51,34,17,0,63,12,12,12,63,42,21,
0
1190 DATA 3,3,3,3,63,42,20,0,51,51,60,
51,51,34,17,0,48,48,48,48,63,42,21,0
1200 DATA 51,63,63,51,51,34,17,0,60,51
,51,51,51,34,17,0,12,51,51,51,63,42,4,
0
1210 DATA 60,51,51,60,48,32,16,0,12,51
,51,51,63,40,5,0,60,51,51,60,51,34,17,
0
1220 DATA 15,48,12,3,63,42,20,0,63,12,
12,12,12,8,4,0,51,51,51,51,63,42,4,0
1230 DATA 51,51,51,51,63,8,4,0,51,51,5
1,63,63,34,17,0,51,51,12,51,51,34,17,0
1240 DATA 51,51,12,12,12,8,4,0,63,3,12
,48,63,42,21,0,170,106,90,86,85,87,95,
127
1250 DATA 85,149,165,169,170,171,175,1
91,170,171,175,191,255,254,250,234,85,
87,95,127,255,254,250,234
1260 DATA 255,127,95,87,85,87,95,127,0
,3,15,63,255,127,95,87,0,0,1,6,26,106,
106,106
1270 DATA 0,0,85,170,170,170,170,170,0
,0,85,170,171,175,131,160,0,0,85,170,2
55,192,255,15
1280 DATA 0,0,85,170,239,143,143,207,0
,0,85,170,239,207,207,207,0,0,85,170,2
55,207,255,255
1290 DATA 0,0,85,170,175,207,207,143,0
,0,85,170,255,192,254,202,0,0,85,170,2
39,143,143,143
1300 DATA 0,0,85,170,171,239,195,160,0
,0,85,170,239,131,163,227,0,0,85,170,2
54,250,248,248
1310 DATA 0,0,85,170,191,252,252,252,0
,0,85,170,250,252,252,252,0,0,85,170,2
55,252,252,252
1320 DATA 0,0,85,170,250,254,254,254,0
,0,64,144,164,169,169,169,95,124,255,2
55,255,63,79,80
1330 DATA 245,61,223,255,255,252,241,5
,175,188,255,255,255,63,143,160,250,62
,207,255,255,252,242,10
1340 DATA 80,67,0,0,0,192,112,95,5,193
,48,0,0,3,13,245,160,131,0,0,0,192,176
,175
1350 DATA 10,194,48,0,0,3,14,250,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0
1360 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0
1370 DATA 255,253,245,213,85,213,245,2
53,106,106,106,26,6,1,0,0,170,170,170,
170,170,85,0,0
1380 DATA 143,143,143,128,170,85,0,0,2
55,255,255,2,170,85,0,0,207,207,131,16
0,170,85,0,0
1390 DATA 207,207,143,128,170,85,0,0,1
94,234,234,170,170,85,0,0,143,143,143,
128,170,85,0,0
1400 DATA 255,255,255,0,170,85,0,0,207
,207,207,128,170,85,0,0,195,224,232,17
0,170,85,0,0
1410 DATA 255,254,58,42,170,85,0,0,239
,207,143,128,170,85,0,0,252,252,252,10
,170,85,0,0
1420 DATA 255,255,63,0,170,85,0,0,252,
252,248,40,170,85,0,0,252,252,252,8,17
0,85,0,0
1430 DATA 254,254,254,10,170,85,0,0,16
9,169,169,164,144,64,0,0,85,85,85,85,8
5,85,85,85
1440 DATA 170,170,170,170,170,170,170,
170,0,0,0,0,0,3,15,63,0,0,0,0,0,192,24
0,252
1450 DATA 85,21,5,1,0,0,0,0,170,168,16
0,128,0,0,0,0,0,192,240,252,255,254,25
0,234
1460 REM PRE-GAME SETUP
1470 POKE 708,K5:POKE 709,K10:POKE 710
,15:POKE 711,K8:POKE 712,K0
```

# Supereversion *continued*

```
1480 RESTORE 1490:POSITION K4,K0:FOR X
=K4 TO 35:READ A:? CHR$(A);:NEXT X:?
1490 DATA 1,2,2,3,4,5,6,6,7,8,9,10,7,8
,9,10,6,6,9,10,7,11,4,12,13,14,15,16,1
7,2,2,18
1500 POSITION K4,K1:? "abbcdedfghijjji
klhijjjdmnopqrbbs"
1510 C=K1:FOR X=K0 TO K7:FOR Y=K0 TO K
7
1520 POSITION 19+X+X-Y-Y,4+X+Y:? CHR$(
116+C);CHR$(116+C);CHR$(58+C);CHR$(60+
C)
1530 C= NOT C:NEXT Y:C= NOT C:NEXT X
1540 C=K1:FOR X=K0 TO K6
1550 POSITION 16-X-X,K4+X:? CHR$(246);
CHR$(163+C);CHR$(165+C)
1560 POSITION 21+X+X,K4+X:? CHR$(167+C
);CHR$(169+C);CHR$(247)
1570 POSITION 15-X-X,18-X:? CHR$(120);
CHR$(190);CHR$(171+C);CHR$(173+C)
1580 POSITION 21+X+X,18-X:? CHR$(219+C
);CHR$(221+C);CHR$(191);CHR$(121)
1590 C= NOT C:NEXT X
1600 FOR I=K0 TO K8:READ A,B,C:FOR J=K
0 TO C:READ D:COLOR D:PLOT A+J,B:NEXT
J:NEXT I
1610 DATA 18,3,3,246,163,169,247,3,11,
1,128,224,35,11,1,223,250,17,19,5,120,
190,171,221,191,121
1620 DATA 19,20,1,120,121,19,10,1,25,2
6,19,12,1,25,26,17,11,1,19,20,21,11,1,
19,20
1630 POSITION 9,K2:? "PRESS /START/ TO
 PLAY"
1640 POSITION K2,K3:? "PLAYER ONE":POS
ITION K3,K5:? "STICK ONE":POSITION K3,
K6:? "/OPTION/"
1650 POSITION 28,K3:? "PLAYER TWO":POS
ITION 29,K5:? "COMPUTER":POSITION 29,K
6:? "/SELECT/"
1660 POSITION K2,16:? "WHITE":POSITION
 K2,18:? "SCORE 2":POSITION K2,20:? "R
ESERVE 30"
1670 POSITION 33,16:? "BLACK":POSITION
 30,18:? "SCORE 2":POSITION 28,20:? "R
ESERVE 30"
1680 POKE 53276,192
1690 FOR X=K0 TO K7:FOR Y=K0 TO K7:GRI
D(X,Y)=K0:NEXT Y:NEXT X
1700 GRID(K4,K3)=K1:GRID(K3,K4)=K1:GRI
D(K3,K3)=K2:GRID(K4,K4)=K2
1710 P(K1)=K1:P(K2)=K0:SC(K1)=K2:SC(K2
)=K2:PASS=K0
1720 POKE 559,46
1730 REM PLAYER SELECTION
1740 FOR I=K0 TO 11:POKE 706,PEEK(BRIT
E+I):POKE 707,15-PEEK(BRITE+I)
1750 Q=USR(MOVE,K2,PMB,SPIN+I*K7,66,20
,K7):Q=USR(MOVE,K3,PMB,SPIN+77-I*K7,18
1,20,K7)
1760 IF PEEK(53279)=K3 THEN P(K1)=P(K1
)+K1:POSITION K3,K5:? PL$(P(K1)*K10+K1
,P(K1)*K10+K10)
1770 IF PEEK(53279)=K5 THEN P(K2)=P(K2
)+K1:POSITION 29,K5:? PL$(P(K2)*K10+K1
,P(K2)*K10+K10)
1780 IF P(K1)>K2 THEN P(K1)=K0
1790 IF P(K2)>K2 THEN P(K2)=K0
1800 IF PEEK(53279)=K6 THEN 1820
1810 NEXT I:GOTO 1740
1820 POKE 706,14:POKE 707,K0:Q=USR(MOV
E,K2,PMB,SPIN,66,20,K7):Q=USR(MOVE,K3,
PMB,SPIN,181,20,K7)
1830 POSITION 9,K2:? "
      ":POSITION K3,K6:? "          ":POS
ITION 29,K6:? "          "
1840 GOTO 90
1850 REM GAME OVER
1860 Q=USR(MOVE,K0,PMB,K0,K0,K0,K0):FO
R I=K1 TO K8:Z=PEEK(711):POKE 711,Z+(Z
<K8)-(Z>K8):NEXT I
1870 IF SC(K1)=SC(K2) THEN POSITION 14
,21:? "IT IS A TIE.":GOTO 1910
1880 POSITION 12,21:? "PLAYER ";
1890 IF SC(K1)>SC(K2) THEN ? "ONE WINS
!"
1900 IF SC(K2)>SC(K1) THEN ? "TWO WINS
!"
1910 FOR I=K0 TO 500:NEXT I
1920 FOR I=704 TO 711:FOR J=PEEK(I) TO
 K0 STEP -K1:POKE I,J:NEXT J:NEXT I
1930 ? CHR$(125):POKE 559,K0:GOTO 1470
```

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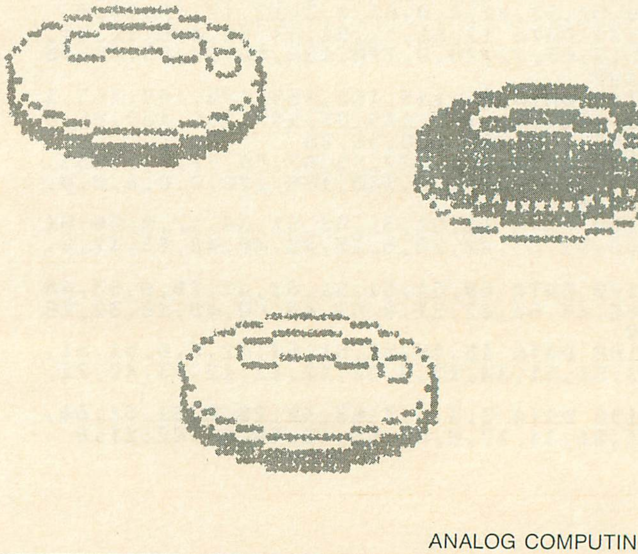
## CHECKSUM DATA.

*(see page 24)*

```
10 DATA 273,459,358,248,984,656,47,316
,664,651,569,744,509,499,351,7328
160 DATA 270,749,758,713,106,144,548,5
42,724,702,992,40,756,94,814,7952
310 DATA 565,677,686,17,346,725,194,73
9,144,398,780,816,729,857,107,7780
455 DATA 148,352,814,420,138,949,817,9
47,142,908,547,515,318,663,715,8393
520 DATA 87,670,411,11,94,726,732,712,
969,710,758,97,838,422,429,7666
670 DATA 462,420,158,705,778,176,268,2
64,276,284,43,241,743,145,564,5527
820 DATA 676,727,846,921,706,390,966,7
06,358,632,153,57,648,741,444,8971
970 DATA 197,113,504,238,449,999,867,8
49,283,363,102,139,105,630,463,6301
1120 DATA 454,63,150,347,807,69,749,46
8,790,844,385,50,382,349,570,6477
1270 DATA 5,215,209,241,211,552,178,14
1,602,714,185,211,240,245,990,4939
1420 DATA 633,905,238,292,953,629,652,
597,520,46,221,828,160,492,503,7669
1570 DATA 221,303,666,659,601,225,797,
888,655,730,581,490,117,218,138,7289
1720 DATA 184,900,506,724,75,21,693,69
8,650,802,675,495,663,796,946,8828
1870 DATA 323,956,145,185,399,634,412,
3054
```

•



# Lyco Computer Marketing & Consultants

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| GP 550 AT (Atari) | 249 |
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| GP 700 AT (Atari) | 459 |
| GP 700 AP (Apple) | 459 |
| Elite 5CD (C-64) | 329 |

### BLUE CHIPS
| | |
|---|---|
| M12010 | $275 |
| M12010 C-64 | $275 |

### C. ITOH
| | |
|---|---|
| Prowriter 8510 AP | 279 |
| 8510 BC2 | 389 |
| 8510 BP1 | 319 |
| 8510 SP | 379 |
| 8510 SR | 429 |
| 8510 SCP | 459 |
| 8510 SCR | 479 |
| 7500 AP | 205 |
| 7500 AP | 245 |
| 1550 P | 449 |
| 1550 BCD | 489 |
| A-10-20-P | 459 |
| F 10 40 PU or RDU | 888 |
| F10 SSPU or RDU | 1069 |

### CARDCO
| | |
|---|---|
| LQ1 | 369 |
| LQ3 | 279 |

### CITIZEN
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|---|---|
| MSP-10 | 329 |
| MSP-15 | 499 |
| MSP-20 | 479 |
| MSP-25 | 649 |

### COMREX
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| CR-II-ES Comriter II E Parallel | 379 |
| CR-IV-C Comriter IV Parallel | 689 |
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### Corona
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|---|---|
| Juki 6100 | 379 |
| RS 232 Serial Board | 55 |
| Tractor | 119 |
| Sheet Feeder | 209 |
| Juki 6300 | 769 |

### LEGEND
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|---|---|
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| 1080 | 239 |
| 1200 | 249 |

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| Spirit 80 | 255 |
| MTL-160L | 549 |
| MTL-180L | 739 |

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| NEC 8025 | $699 |
| NEC 8027 | $359 |

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| Okimate 10 | 179 |
| 82A | 295 |
| 84 | 645 |
| 92 | 349 |
| 93 | 565 |
| 92 Imagewriter | 425 |
| 92 IBM Version | 349 |

### OLIVETTI
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| DY 250 Parallel | 739 |
| DY 250 Serial | 729 |
| DY 450 Parallel | 1099 |
| DY 450 Serial | 1079 |

### PANASONIC
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| 1090 | 189 |
| 1091 | 259 |
| 1092 | 395 |
| 1093 | 589 |
| 3151 | 459 |

### Smith Corona
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|---|---|
| Fastext 80 | 189.00 |
| D100 | 219.00 |
| D200 | 399.00 |
| D300 | 519.00 |
| L1000 | 339.00 |

### STARMICRONICS
| | |
|---|---|
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| SG-15 | 379 |
| SD-10 | 339 |
| SD-15 | 445 |
| SR-10 | 489 |
| SR-15 | 585 |
| Powertype | 309 |
| Gemini 10X | CALL |
| Gemini 15X | CALL |
| SB-10 | CALL |

## MONITORS

### AMDEK
| | |
|---|---|
| 300 Green | 125 |
| 300 Amber | 139 |
| 310 Amber IBM | 155 |
| Color 300 Audio | 245 |
| Color 500 Composite | 369 |
| Color 600 | 429 |
| Color 700 | 495 |
| Color 710 | 569 |

### GORILLA
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| 2" Amber | 84 |

### NEC
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| JB-1260 Green | 95 |
| JB-1201 Green | 135 |
| JC 1215 Color | 235 |
| JC 1216 RGB | 375 |
| JC1460 Color | 265 |
| JB-1205 Amber | 139 |

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| DT 1300 RG1 composite | 329 |

### PRINCETON GRAPHICS
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|---|---|
| MAX-12 Amber | 189 |
| HX-12 RGB | 475 |
| SR-12 RGB | 599 |

### SAKATA
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|---|---|
| SC-100 Color | 219 |
| STS1 Stand | 29 |
| SG 1000 Green | 99 |
| SA 1000 Amber | 109 |

### TAXAN
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|---|---|
| 210 Color RBG | 249 |
| 115 Green | 119 |
| 116 Amber | 125 |
| 400 Color RGB | 275 |
| 410 Color RGB | 339 |
| 420 Color IBM | 429 |
| 121 Green IBM | 139 |
| 122 Amber IBM | 145 |

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| | |
|---|---|
| Comcolor I Composite Green | 199 |

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| | |
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# AtariWriter Printer Driver

**by C.D. Welker**

Several commercial word processors lack a provision for inputting printer codes to function properly with third-party printers.

For example, **AtariWriter** adequately supports their own line of printers, but control codes for third-party printers must be imbedded into the text by using a CTRL-O command. To initiate underlining on **AtariWriter** with an Epson printer, the following is required: *CTRL-O 27 CTRL-O 45 CTRL-O 49*—a total of nine keystrokes. A similiar series is needed to stop it.

After underlining a few reports with a ruler and pen, I decided to fix this problem via the **AtariWriter Printer Driver** (or **AWPD**).

The BASIC program given in Listing 1 will create an AUTORUN.SYS program that should be booted in when you use your word processor. Use printer mode 2 with **AtariWriter** (i.e., the Atari 825 printer mode).

The AUTORUN.SYS program made by the BASIC program is compatible with all Atari operating systems and with single or double density DOS, since it uses relocatable code.

The program disk is single density and will only write the AUTORUN.SYS printer driver onto another single density disk. If you have a double density disk drive, just transfer the AUTORUN.SYS program to a double density disk after making it. The SDCOPY option of OSA DOS can be used to do this if you have the DOS.

If you use an RS-232 device, the program to boot in this device driver should be appended to the underliner AUTORUN.SYS program by using the copy append function of Atari's DOS.

The procedure to do this is as follows. First rename the 850 interface driver program. If it is now called AUTORUN.SYS, change its name to AUTO850.SYS. Then transfer the file AUTO850.SYS to the disk that contains the **AWPD**. The printer driver should be named AUTORUN.SYS.

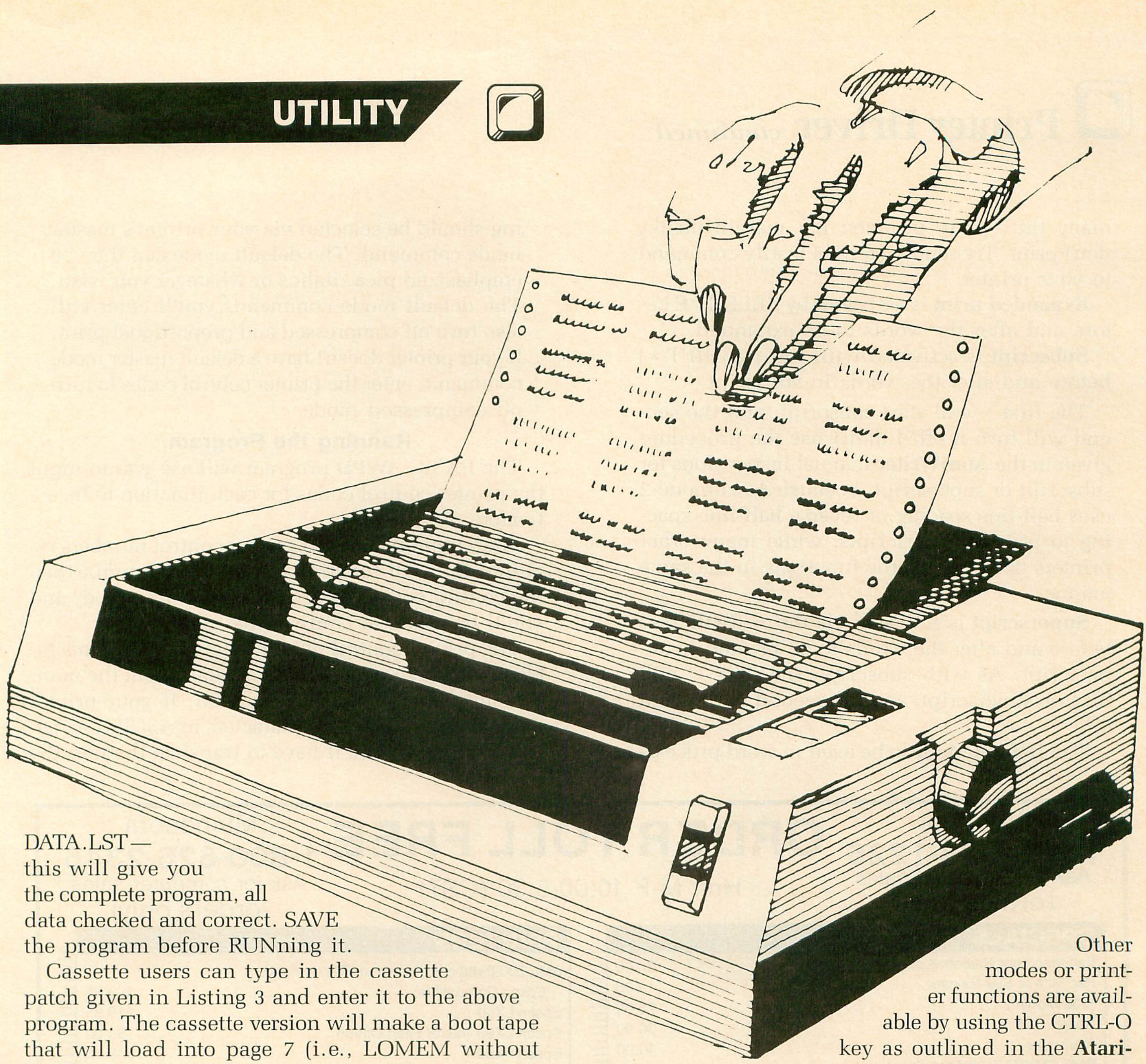
Finally, use the copy append option of Atari DOS (i.e., option C) to append the 850 driver to the printer driver as follows.

```
C
AUTO850.SYS,AUTORUN.SYS/A
```

The slash-A is needed to append the programs. Don't forget it. Also, be sure that you append the 850 driver to the printer driver, not the other way around.

The short program given in Listing 2 may be used to check the data input. I recommend that you first type in the BASIC program in Listing 1, except for the data statements, and save it. Next, type in Listing 2 and use it to check your data input. If your data is correct, the second program will list it to disk in the file DATA.LST.

Finally, reload the first part of Listing 1 and enter



DATA.LST—this will give you the complete program, all data checked and correct. SAVE the program before RUNning it.

Cassette users can type in the cassette patch given in Listing 3 and enter it to the above program. The cassette version will make a boot tape that will load into page 7 (i.e., LOMEM without DOS).

The program's source code is given in Listing 4. Assembly programmers may want to study it as a demonstration of several useful techniques: implementation of self-relocating code, a method to JSR within relocatable code by modifying the stack, and use of long branches.

### Program features.

The **AWPD** is designed to work with print option 2 of the **AtariWriter**, the option designated for use with Atari's 825 printer. This option sends print control characters to the printer; the other options do not.

Third-party printers will be very easy to use with **AtariWriter** and **AWPD**.

The printer driver AUTORUN.SYS program you make will activate the following features (assuming that your printer has these capabilities): underlining, subscripts, superscripts, expanded, condensed and proportional print.

Other modes or printer functions are available by using the CTRL-O key as outlined in the **AtariWriter** manual. The following special features are provided by **AWPD**.

**Underline** individual words by using the INVERSE key. Underline words *plus* blank spaces between words by using the [ and ] (SHIFT-COMMA and SHIFT-PERIOD) around the statement to be underlined. I added this feature because **AtariWriter** can't print spaces between words as inverse characters.

**Compressed print** is activated by CTRL-G2 as described in the **AtariWriter** manual.

**Proportional print** is activated by CTRL-G3 as described in the manual.

**Return to 10 cpi** or the default mode selected with your printer by using CTRL-G1.

Note that **AtariWriter** doesn't permit you to mix condensed print or proportional print with 10 cpi on the same text line. Also, proportional print doesn't work well with **AtariWriter** and many third-party printers; left margin blanks don't print. Try sending a right justify command to your printer.

**Expanded print** is activated by SELECT E before and after the words to be expanded.

**Subscript** is activated with the \ (SHIFT-*) before and after the words in subscript.

The first \ will start subscript, and the second will turn it off. I didn't use the procedure given in the **AtariWriter** manual instructions for subscript or superscript, because Atari mode 2 uses half-line spacing or reverse half-line spacing to print the subscripts, while many other printers don't handle the functions in the same manner.

**Superscript** is activated via the ∧ (SHIFT-+) before and after the words to be printed in superscript. As with subscript, the first ∧ will turn on superscript, and the second will turn it off.

The **Default Mode** to be used in word processing should be selected via your printer's master mode command. The default mode can then be emphasized pica, italics or whatever you wish. The default mode commands you'll enter will also turn off compressed and proportional print. If your printer doesn't have a default master mode command, enter the printer control codes to turn off compressed mode.

### Running the Program.

The BASIC **AWPD** program will ask you to input the printer control codes for each function to be activated.

First, input the total of printer control numbers required for each function (up to 3 maximum), then the control codes. Error checking is provided, and you'll be asked to confirm the numbers.

The printer control numbers can be found in a table provided in your printer manual. Input the numbers in decimal, not hexadecimal. If your printer manual gives its control characters in ASCII (i.e., letters, etc.), then you'll have to translate them to the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equivalent decimal numbers.

If you're *really* unlucky, the printer manual may only give the code as binary numbers. Some Japanese printers do this. They write manuals that can only be understood by an electrical engineer after a week of study.

I've included a table at the end of these instructions, to help you convert your printer codes from binary or ASCII to the appropriate decimal numbers.

If your printer doesn't have the printer function requested by **AWPD**, you must input a decimal number that does nothing when it's sent to the printer. I suggest you try the following.

Type *1* for the number of characters, followed by *0* for the control character. The number zero does nothing when sent to most printers.

After you've entered all the control characters, the program will request that you insert a freshly formatted disk with DOS. The AUTORUN.SYS program will be written to the disk when you press START.

Be sure that the disk you use doesn't already contain an AUTORUN.SYS file, since it will be written over by the program and lost forever.

### Entering the Codes.

A few examples follow to clarify the procedure for entering control codes. For underlining, input the underscore all control code:

**EPSON**

**Stop Underline**

Input 3 for the number of characters
Followed by: 27,45,48

**Start Underline**

Input 3 for the number of characters
Followed by: 27,45,49

**OLD-STYLE PRINTERS**

Some limited function printers can only underline by using the underscore key and backspacing, with no command to stop underlining. In these cases, use the following sequence.

**Stop Underline**

Input 1 Followed by: 0

**Start Underline**

Input 2 Followed by: 95,8

### Default Mode

**Epson Printer**

Input 3 for the number of characters
Followed by: 27,33,56

This is the Epson master mode command to revert to emphasized pica for high quality print. The default mode also turns off compressed print and proportional print, when activated by CTRL-G1 with **AtariWriter**.

If you don't want emphasized pica, change the number 56 to the print style you wish. See the appendix in your Epson manual.

### Panasonic KX-P1090.

This printer doesn't have proportional print, so enter 1 for the number of characters.

Followed by: 18

These numbers turn off condensed print as the default mode.

### Smith Corona TPII.

This printer doesn't have condensed print or proportional print; it's a daisy wheel printer.

Input 1 for the number of characters
Followed by: 0

**Epson example all codes.**

| Function | Number | Control Codes |
|---|---|---|
| Subscript on | 3 | 27,83,49 |
| Subscript off | 2 | 27,84 |
| Superscript on | 3 | 27,83,48 |
| Superscript off | 2 | 27,84 |
| Default mode | 3 | 27,33,56 |
| Expanded off | 3 | 27,87,48 |
| Condensed on | 3 | 27,33,54 |
| Proportional on | 3 | 27,112,49 |
| Expanded on | 3 | 27,87,49 |
| Underline on | 3 | 27,45,49 |
| Underline off | 3 | 27,45,48 |

**Panasonic KX-P1090 all codes.**

| Function | Number | Control Codes |
|---|---|---|
| Subscript on | 3 | 27,83,1 |
| Subscript off | 2 | 27,84 |
| Superscript on | 3 | 27,83,0 |
| Superscript off | 2 | 27,84 |
| Default mode | 1 | 18 |
| Expand off | 3 | 27,87,0 |
| Condensed on | 1 | 15 |
| Proportional on | 1 | 0 |
| Expanded on | 3 | 27,87,1 |
| Underline on | 3 | 27,45,1 |
| Underline off | 3 | 27,45,0 |

**Smith Corona TPII all codes.**

| Function | Number | Control Codes |
|---|---|---|
| Subscript on | 1 | 0 |
| Subscript off | 1 | 0 |
| Superscript on | 1 | 0 |
| Superscript off | 1 | 0 |
| Default mode | 1 | 0 |
| Expanded off | 1 | 0 |
| Condensed on | 1 | 0 |
| Proportional on | 1 | 0 |
| Expanded on | 1 | 0 |
| Underline on | 1 | 25 |
| Underline off | 1 | 31 |

*(continued on next page)*

### How it works.

The underliner program operates by intercepting characters sent to the printer before they reach their destination. Checks are made to determine if command codes are sent. For example, **AWPD** looks for the underline and stop underline key flags.

If the command to start underlining is sent to your printer, then your print control commands are sent instead of the bracket.

The **AtariWriter** sends a character to your printer through the CIO (Central Input/Output) routines. This operates through a series of subroutines that handle the actual mechanics of sending data to your printer, screen, disk drive, etc.

The location and functions of these worker routines differ in the Atari 800, 800XL and 1200 computers. Consequently, a system of pointers or vectors were provided by Atari, to keep track of the location of these routines in the several operating systems.

The handler table is the master index to the system of subroutines that handle various devices which can be hooked up to your computer. It serves as an index to a table of contents.

The handler table is located at decimal 794 in all Ataris. The device entry tables are in different locations.

The structures of the handler table and printer entry point table are shown in Figures 1 and 2.

**HANDLER ADDRESS TABLE**

| Address | Data | Device | |
|---|---|---|---|
| $031A | 50 | P | Printer |
| $031B | 30E4 | | Entry point |
| $031D | 43 | C | Cassette |
| $031E | 40E4 | | Entry point |
| $0320 | 45 | E | Editor |
| $0321 | 00E4 | | Entry point |
| $0323 | 53 | S | Screen |
| $0324 | 10E4 | | Entry point |
| $0326 | 4B | K | Keyboard |
| $0327 | 20E4 | | Entry point |

The remaining locations are used for DOS 850 module and user routines.

**Figure 1.**

**PRINTER ENTRY POINT TABLE**
**ATARI 800**

| Address | Data | Function |
|---|---|---|
| $E430 | 9E EE | Open |
| $E432 | DB EE | Close |
| $E434 | 9D EE | Read |
| $E436 | A6 EE | Write |
| $E438 | 80 EE | Status |
| $E438 | 90 EE | Not used |
| $E43C | 4C 78 EE | Initialize |

**Figure 2.**

Note: the hex addresses in the handler table are stored in low byte/high byte order. They must be reversed to be understood. The addresses given in the entry point table indicate the worker subroutine minus one, for technical reasons dealing with the stack and its handling of jump subroutine statements.

### Machine language program.

When you boot in the underliner disk, the AUTORUN.SYS program is called by DOS and is activated before control is returned to the **AtariWriter** cartridge. During this initiation sequence, the program does several things. First, it reads the handler table from the bottom up, to find the your computer's address for the printer entry point table.

It then reads the entire entry point table in your OS and sticks the addresses in a table located at the bottom of the stack in page 1.

Next, the segment of code that does the work of converting the codes from **AtariWriter**'s 825 printer to your printer's codes is relocated to LOMEM. The LOMEM pointer is changed to protect the program. The addresses in the handler table are changed to point to this program, and finally, control is returned to **AtariWriter**.

### Printer driver code.

The handler table tells the CIO to send the characters to the "printer driver" program, where they're processed. Each character byte is examined in a microsecond or two, to determine if it's an escape character or a flag key to start or stop underlining.

If it is an escape key, it and the next character are sent to the OS write routines without modification. The program also checks for the carriage return to temporarily turn off underlining, until the left margin blanks are printed.

### Customizing the program.

The **AtariWriter** mode 2 is the only mode that automatically sends out printer control characters. It sends out half-line spaces for top and bottom margins. The printer driver divides them in half and sends out standard line feed signals.

The underline function is performed by transmitting a command to underline before each inverse character and one to stop underlining after the character. Consequently, spaces between characters cannot be underlined using inverse.

The data below gives the series of printer control signals sent out by mode 2 for the top margin and after each carriage return for the left margin. The program will transform these characters to your printer control characters.

| PRINT CONTROL CHARACTERS SENT BY MODE 2 | |
|---|---|
| TOP MARGIN | |
| $1B,$13 | Select 10 cpi |
| $0E | Stop underline |
| $1B,$0F | Stop double wide print |
| $1B,$1C | Half-line feeds done 12 times for 6 lines |
| $1B,$13 | Select 10 cpi |
| $0E | Stop underline |
| $1B,$0F | Stop double wide print |

Well, that's all there is to it. I hope the **AtariWriter Printer Driver** will make your future use of **AtariWriter** more enjoyable. □

**BINARY TO DECIMAL CONVERSION TABLE**

| B 7 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
|---|---|---|---|---|---|---|---|---|
| I 6 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| T 5 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 4321 | | | | | | | | |
| 0000 | 0 | 16 | 32 | 48 | 64 | 80 | 96 | 112 |
| 0001 | 1 | 17 | 33 | 49 | 65 | 81 | 97 | 113 |
| 0010 | 2 | 18 | 34 | 50 | 66 | 82 | 98 | 114 |
| 0011 | 3 | 19 | 35 | 51 | 67 | 83 | 99 | 115 |
| 0100 | 4 | 20 | 36 | 52 | 68 | 84 | 100 | 116 |
| 0101 | 5 | 21 | 37 | 53 | 69 | 85 | 101 | 117 |
| 0110 | 6 | 22 | 38 | 54 | 70 | 86 | 102 | 118 |
| 0111 | 7 | 23 | 39 | 55 | 71 | 87 | 103 | 119 |
| 1000 | 8 | 24 | 40 | 56 | 72 | 88 | 104 | 120 |
| 1001 | 9 | 25 | 41 | 57 | 73 | 89 | 105 | 121 |
| 1010 | 10 | 26 | 42 | 58 | 74 | 90 | 106 | 122 |
| 1011 | 11 | 27 | 43 | 59 | 75 | 91 | 107 | 123 |
| 1100 | 12 | 28 | 44 | 60 | 76 | 92 | 108 | 124 |
| 1101 | 13 | 29 | 45 | 61 | 77 | 93 | 109 | 125 |
| 1110 | 14 | 30 | 46 | 62 | 78 | 94 | 110 | 126 |
| 1111 | 15 | 31 | 47 | 63 | 79 | 95 | 111 | 127 |

| DEC | HEX | CHAR | DEC | HEX | CHAR | DEC | HEX | CHAR | DEC | HEX | CHAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 01 | | 33 | 21 | ! | 65 | 41 | A | 97 | 61 | a |
| 2 | 02 | | 34 | 22 | " | 66 | 42 | B | 98 | 62 | b |
| 3 | 03 | | 35 | 23 | # | 67 | 43 | C | 99 | 63 | c |
| 4 | 04 | | 36 | 24 | $ | 68 | 44 | D | 100 | 64 | d |
| 5 | 05 | | 37 | 25 | % | 69 | 45 | E | 101 | 65 | e |
| 6 | 06 | | 38 | 26 | & | 70 | 46 | F | 102 | 66 | f |
| 7 | 07 | | 39 | 27 | ' | 71 | 47 | G | 103 | 67 | g |
| 8 | 08 | | 40 | 28 | ( | 72 | 48 | H | 104 | 68 | h |
| 9 | 09 | | 41 | 29 | ) | 73 | 49 | I | 105 | 69 | i |
| 10 | 0A | | 42 | 2A | * | 74 | 4A | J | 106 | 6A | j |
| 11 | 0B | | 43 | 2B | + | 75 | 4B | K | 107 | 6B | k |
| 12 | 0C | | 44 | 2C | , | 76 | 4C | L | 108 | 6C | l |
| 13 | 0D | | 45 | 2D | – | 77 | 4D | M | 109 | 6D | m |
| 14 | 0E | | 46 | 2E | . | 78 | 4E | N | 110 | 6E | n |
| 15 | 0F | | 47 | 2F | / | 79 | 4F | O | 111 | 6F | o |
| 16 | 10 | LF | 48 | 30 | 0 | 80 | 50 | P | 112 | 70 | p |
| 17 | 11 | | 49 | 31 | 1 | 81 | 51 | Q | 113 | 71 | q |
| 18 | 12 | | 50 | 32 | 2 | 82 | 52 | R | 114 | 72 | r |
| 19 | 13 | | 51 | 33 | 3 | 83 | 53 | S | 115 | 73 | s |
| 20 | 14 | | 52 | 34 | 4 | 84 | 54 | T | 116 | 74 | t |
| 21 | 15 | | 53 | 35 | 5 | 85 | 55 | U | 117 | 75 | u |
| 22 | 16 | | 54 | 36 | 6 | 86 | 56 | V | 118 | 76 | v |
| 23 | 17 | | 55 | 37 | 7 | 87 | 57 | W | 119 | 77 | w |
| 24 | 18 | | 56 | 38 | 8 | 88 | 58 | X | 120 | 78 | x |
| 25 | 19 | | 57 | 39 | 9 | 89 | 59 | Y | 121 | 79 | y |
| 26 | 1A | | 58 | 3A | : | 90 | 5A | Z | 122 | 7A | z |
| 27 | 1B | ESC | 59 | 3B | ; | 91 | 5B | [ | 123 | 7B | |
| 28 | 1C | | 60 | 3C | < | 92 | 5C | \ | 124 | 7C | |
| 29 | 1D | | 61 | 3D | = | 93 | 5D | ] | 125 | 7D | |
| 30 | 1E | | 62 | 3E | > | 94 | 5E | ∧ | 126 | 7E | |
| 31 | 1F | | 63 | 3F | ? | 95 | 5F | _ | 127 | 7F | |
| 32 | 20 | | 64 | 40 | @ | 96 | 60 | | 128 | 80 | |

**Table 1.**

**XL/XE REQUIRES TRANSLATOR**

*To use the **AtariWriter Printer Driver** on XL and XE computers, you must use a "translator" program, like the Atari **Translator** disk or the **Home-made Translator** in this issue.*

**Listing 1.**
**BASIC listing.**

```
310 REM PRINTER DRIVER MAKER
320 REM BY C.D. WELKER
330 GRAPHICS 17:? #6:? #6;"      HOME MA
DE":? #6;" PRINTER DRIVER"
335 ? #6;" FOR ATARI WRITER"
336 ? #6;"    MODE II"
337 ? #6
340 ? #6:? #6;" BY c.d.welker":? #6
350 ? #6;" INITIALIZING"
355 ? #6;" PLEASE WAIT"
360 ? #6:? #6;"INPUT CONTROL NUMBER"
370 ? #6;"IN DECIMAL NOT HEX":? #6
372 ? #6;" INPUT NUMBER 0"
373 ? #6;" IF PRINTER DOESN'T"
374 ? #6;" HAVE THE FUNCTION"
375 ? #6;" REQUESTED"
380 REM INITIATE STRINGS PART II
390 STSIZE=613
400 DIM A$(STSIZE),B$(3),C$(3),D$(3)
410 DIM JSR$(3),JMP$(3),E$(1),VAR$(3)
420 DIM FUNCT$(40)
430 DIM OK$(3)
440 REM INITIALIZE STRINGS
450 E$=CHR$(234):REM █ = NOP
460 A$=" ":A$(STSIZE)=A$:A$(2)=A$
470 B$=E$:B$(3)=B$:B$(2)=B$
480 C$=B$:VAR$=B$
490 D$="0":D$(3)=D$:D$(2)=D$
500 JSR$(1,1)=CHR$(32)
510 JSR$(2,2)=CHR$(16)
520 JSR$(3,3)=CHR$(1)
530 JMP$(1,1)=CHR$(76)
540 JMP$(2,2)=CHR$(16)
550 JMP$(3,3)=CHR$(1)
555 SIZE=241:CLASS=1
560 RESTORE
570 REM ****************************
580 REM
590 REM START CONTROL BLOCK
600 REM
610 REM ****************************
620 GOSUB 1820:REM READ DATA TO A$
630 REM ****************************
640 REM FLAG=1:CLASS=1:REM USED AS FLA
GS
650 REM FLAG CONTROLS ORDER IN WHICH
660 REM THE STRING IS SEARCHED
670 REM CLASS STRIPS OFF ESC OR ADDS
680 REM "1" AFTER ESC,DOES NOTHING
690 FUNCT$="SUBSCRIPTS ON":GOSUB 900
700 FUNCT$="SUBSCRIPTS OFF":GOSUB 900
710 FUNCT$="SUPERSCRIPTS ON":GOSUB 900
720 FUNCT$="SUPERSCRIPTS OFF":GOSUB 90
0
725 CLASS=2
730 FUNCT$="SET DEFAULT MODE":GOSUB 90
0
740 FUNCT$="EXPAND MODE OFF":GOSUB 900
750 FUNCT$="CONDENSED MODE ON":GOSUB 9
00
760 FUNCT$="PROPORT MODE ON":GOSUB 900
770 FUNCT$="EXPAND MODE ON":GOSUB 900
775 CLASS=1
780 FUNCT$="UNDERLINE ON":GOSUB 900
790 FUNCT$="UNDERLINE OFF":GOSUB 900
```

# Printer Driver *continued*

```
830 REM ***************************
840 GO TO 1070:REM :MAKE AUTORUN.SYS
850 REM ***************************
860 REM
870 REM REQUEST PRINTER CONTROLS
880 REM
890 REM ***************************
900 VAR$=B$:OK$=D$:C$=B$:GOSUB 1160
910 TRAP 32767
920 REM ***************************
930 REM
940 REM CONFIRM PRINTER CONTROL
950 REM
960 REM ***************************
970 TRAP 980
980 GOSUB 1420
990 REM IF OK INSERT BYTES TO A$
1000 IF OK$(1,1)="Y" OR OK$(1,1)="y" T
HEN GOSUB 1050:RETURN
1010 GOTO 900
1020 REM ***************************
1030 REM INSERT BYTES COMMAND
1040 REM :IF CLASS=2 STRIP ESC OR +1
1050 IF CLASS=2 THEN GOSUB 2200
1060 TRAP 1070:GOSUB 1540:RETURN
1070 GOSUB 1980:REM MAKE AUTORUN.SYS
1080 END
1090 REM END OF COMMAND BLOCK
1100 REM ***************************
1110 REM
1120 REM REQUEST PRINT CONTROLS
1130 REM
1140 REM ***************************
1150 REM POKE 752,1 DISABLES CURSOR
POKE 703,4 GIVES A TEXT WINDOW AT BTM
1160 GRAPHICS 1:POKE 752,1:POKE 703,4
1170 PRINT #6;" INPUT THE PRINTER"
1180 PRINT #6;" CONTROL CHARACTERS"
1190 PRINT #6;"        FOR"
1200 PRINT #6;" ";FUNCT$:PRINT #6
1210 PRINT #6;" 3 NUMBERS MAX"
1220 PRINT #6
1230 PRINT #6;" FIRST GIVE TOTAL"
1240 PRINT #6;" NUMBER OF "
1244 PRINT #6;" CHARACTERS"
1250 PRINT #6
1260 PRINT #6;" THEN EACH CHARACTER"
1270 PRINT #6;" AS REQUESTED"
1280 TRAP 1360
1290 PRINT "INPUT TOTAL NUMBER OF CHAR
ACTERS=";:INPUT N
1292 IF N<=3 THEN 1300
1293 ? CHR$(253);"ONLY 3 CHARACTERS PL
EASE "
1294 GOTO 1290
1300 FOR I=1 TO N
1310 PRINT "INPUT CONTROL CHAR NUM ";I
;"= ";
1320 INPUT X2
1330 VAR$(I,I)=CHR$(X2)
1340 NEXT I
1350 RETURN
1360 TRAP 1360:PRINT "OOPS! INPUT ERRO
R TRY AGAIN":GOTO 1290
1370 REM ***************************
1380 REM
1390 REM CONFIRM CONTROL BYTES SUB.
1400 REM
1410 REM ***************************
1420 GRAPHICS 1:PRINT #6;:PRINT #6;" T
HE VALUES INPUTTED":PRINT #6;" ";FUNCT
$:PRINT #6;" ARE AS FOLLOWS:"
1430 PRINT #6:PRINT #6;" BYTE 1= ";ASC
(VAR$)
1440 IF N>1 THEN E$=VAR$(2,2):PRINT #6
;" BYTE 2= ";ASC(E$)
1450 IF N>2 THEN E$=VAR$(3,3):PRINT #6
;" BYTE 3= ";ASC(E$)
```

```
1460 ? :? "IS THIS CORRECT (YES/NO) ="
;:INPUT OK$:RETURN
1470 REM ***************************
1480 REM
1490 REM INSERT BYTES INTO STRINGA$
1500 REM
1510 REM ***************************
1520 REM SEARCH STRING A$ FROM BACK TO
FRONT TO FIND THE CPY# BYTE THEN
1530 REM ADD THE CONTROL FUNCTIONS
1540 J=1:DUM=N
1550 REM ON FLAG GOTO 1570,1560
1560 FOR I=SIZE TO STSIZE
1580 E$=A$(I,I)
1590 VALUE=ASC(E$)
1600 IF VALUE=192 THEN 1620:REM CPY
1610 NEXT I
1620 POP :SIZE=I+14:REM FOUND CPY
1630 A$(I,I)=CHR$(169):I=I+1:REM LDA#
1640 A$(I,I)=VAR$(1,1)
1650 IF DUM=1 THEN GOTO 1750
1660 A$(I+1,I+3)=JSR$:REM JSR=3BYTE
1670 I=I+4
1680 A$(I,I)=CHR$(169):I=I+1:REM LDA#
1690 A$(I,I)=VAR$(2,2)
1700 IF DUM=2 THEN GOTO 1750
1710 A$(I+1,I+3)=JSR$
1720 I=I+4
1730 A$(I,I)=CHR$(169):I=I+1:REM LDA#
1740 A$(I,I)=VAR$(3,3)
1750 A$(I+1,I+3)=JMP$
1760 RETURN
1770 REM ***************************
1780 REM
1790 REM SUBROUTINE TO READ ML TO A$
1800 REM
1810 REM ***************************
1820 TRAP 1920
1830 J=1
1840 FOR I=1 TO 10
1850 READ BYTE
1860 E$=CHR$(BYTE)
1870 A$(J,J)=E$
1880 J=J+1
1890 NEXT I
1900 READ TOTAL
1910 GOTO 1840
1920 RETURN
1930 REM ***************************
1940 REM
1950 REM MAKE AUTORUN.SYS FILE
1960 REM
1970 REM ***************************
1980 GRAPHICS 17:PRINT #6:PRINT #6;" I
NSERT A FORMATED":PRINT #6;" DISK WITH
DOS"
1990 PRINT #6:PRINT #6;" PRESS START K
EY":PRINT #6;" TO CONTINUE"
2000 PRINT #6:PRINT #6;" AN AUTORUN.SY
S FILE":PRINT #6;" WILL BE MADE"
2010 START=PEEK(53279):IF START<>6 THE
N 2010
2020 GRAPHICS 17:PRINT #6:PRINT #6;"
  MAKING":PRINT #6;"AUTORUN.SYS FILE"
2030 CLOSE #2:OPEN #2,8,0,"D:AUTORUN.S
YS"
2040 TRAP 2090
2050 FOR I=1 TO STSIZE
2060 E$=A$(I,I)
2070 PUT #2,ASC(E$)
2080 NEXT I
2090 CLOSE #2
2100 GRAPHICS 17:PRINT #6:PRINT #6;" T
HE AUTORUN.SYS":PRINT #6;" FILE IS MAD
E"
2110 PRINT #6;" HAVE FUN "
2120 FOR J=1 TO 600:NEXT J
```

```
2130 END
2140 RETURN
2150 REM ************************
2160 REM
2170 REM STRIP ESC OR ADD 1 SUBROUTIN
2180 REM
2190 REM ************************
2200 C$=VAR$
2210 IF VAR$(1,1)=CHR$(27) THEN 2290
2220 REM MAKE FIRST CHAR 1
2230 N=N+1
2240 VAR$(1,1)=CHR$(1):REM =$01
2250 VAR$(2,2)=C$(1,1)
2260 VAR$(3,3)=C$(2,2)
2270 RETURN
2280 REM STRIP OFF ESC
2290 N=N-1
2300 VAR$(1,1)=C$(2,2)
2310 VAR$(2,2)=C$(3,3)
2320 VAR$(3,3)=CHR$(234):REM NOP
2330 RETURN
5000 DATA 255,255,0,46,82,48,160,34,18
5,25,90
5010 DATA 3,201,80,240,3,136,208,246,1
40,20,367
5020 DATA 1,56,185,26,3,233,1,133,204,
200,409
5030 DATA 185,26,3,133,205,169,0,133,2
06,169,638
5040 DATA 1,133,207,160,15,177,204,145
,206,136,22
5050 DATA 208,249,173,231,2,141,34,1,1
73,232,466
5060 DATA 2,141,35,1,172,20,1,169,1,15
3,161
5070 DATA 26,3,200,169,1,153,26,3,24,1
73,939
5080 DATA 7,1,105,1,141,17,1,173,8,1,3
94
5090 DATA 105,0,141,18,1,56,173,34,1,2
33,156
5100 DATA 1,141,7,1,173,35,1,233,0,141
,889
5110 DATA 8,1,169,76,141,16,1,169,142,
141,753
5120 DATA 24,1,169,1,141,25,1,24,173,2
4,336
5130 DATA 1,109,34,1,141,231,2,173,35,
1,64
5140 DATA 109,25,1,141,232,2,169,0,141
,26,910
5150 DATA 1,141,27,1,141,24,1,141,25,1
,413
5160 DATA 141,20,1,141,21,1,169,197,13
3,204,441
5170 DATA 169,46,133,205,173,34,1,133,
206,173,714
5180 DATA 35,1,133,207,162,1,160,0,177
,204,794
5190 DATA 145,206,136,208,249,230,205,
230,207,202,812
5200 DATA 240,242,96,141,22,1,201,27,2
08,11,1
5210 DATA 169,1,141,24,1,173,22,1,76,1
6,625
5220 DATA 1,173,24,1,201,1,240,98,173,
22,559
5230 DATA 1,201,15,240,93,201,14,240,9
1,201,856
5240 DATA 92,208,49,173,28,1,201,1,240
,21,870
5250 DATA 169,1,141,28,1,192,27,234,23
4,234,131
5260 DATA 234,234,234,234,234,234,234,
234,234,234,471
5270 DATA 234,169,0,141,28,1,192,27,23
4,234,731
5280 DATA 234,234,234,234,234,234,234,
234,234,234,71
5290 DATA 234,234,201,94,208,56,173,30
,1,201,503
5300 DATA 1,240,29,169,1,141,30,1,192,
27,334
5310 DATA 234,234,234,234,234,234,234,
234,234,234,674
5320 DATA 234,234,234,24,144,6,240,98,
240,92,220
5330 DATA 240,92,169,0,141,30,1,192,27
,234,346
5340 DATA 234,234,234,234,234,234,234,
234,234,234,686
5350 DATA 234,234,201,91,208,9,169,1,1
41,36,10
5360 DATA 1,169,0,240,57,201,93,208,7,
169,155
5370 DATA 0,141,36,1,240,48,201,32,208
,3,65
5380 DATA 76,16,1,173,36,1,201,1,208,2
6,804
5390 DATA 24,173,34,1,105,212,141,20,1
,169,684
5400 DATA 0,109,35,1,141,21,1,72,173,2
0,257
5410 DATA 1,72,169,0,240,6,173,22,1,76
,17
5420 DATA 16,1,240,121,240,121,169,0,1
41,24,90
5430 DATA 1,173,22,1,201,19,208,15,192
,33,955
5440 DATA 234,234,234,234,234,234,234,
234,234,234,295
5450 DATA 234,234,234,201,15,208,15,19
2,87,234,949
5460 DATA 234,234,234,234,234,234,234,
234,234,234,289
5470 DATA 234,234,201,28,208,32,173,26
,1,201,627
5480 DATA 1,208,15,169,0,141,26,1,169,
1,358
5490 DATA 32,16,1,169,10,76,16,1,169,1
,849
5500 DATA 141,26,1,169,1,76,16,1,201,2
0,501
5510 DATA 208,15,192,33,234,234,234,23
4,234,234,353
5520 DATA 234,234,234,234,234,234,234,
201,17,208,417
5530 DATA 18,192,112,234,234,234,234,2
34,234,234,377
5540 DATA 234,234,234,234,234,240,24,2
40,37,201,289
5550 DATA 14,208,15,192,87,234,234,234
,234,234,975
5560 DATA 234,234,234,234,234,234,234,
234,76,16,939
5570 DATA 1,192,27,234,234,234,234,234
,234,234,797
5580 DATA 234,234,234,234,234,234,192,
27,234,234,888
5590 DATA 234,234,234,234,234,234,234,
234,234,234,228
5600 DATA 234,224,2,225,2,196,46,226,2
,227,612
5605 DATA 2,0,46
5610 REM * 613 BYTES
```

•

*(CHECKSUM DATA and assembly listing start on page 85)*

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# Printer Driver *continued*

CHECKSUM DATA.

(see page 24)

```
310 DATA 137,147,953,899,638,982.607,2
72,518,840,173,445,851,630,765,8857
380 DATA 641,974,252,440,349,653,775,9
96,999,247,144,211,846,850,606,8983
530 DATA 861,849,605,736,905,568,106,5
84,84,552,332,361,580,30,285,7438
670 DATA 879,828,285,973,14,558,543,38
1,829,111,849,952,555,732,276,8765
830 DATA 365,900,568,106,881,112,383,3
76,844,364,99,530,105,560,767,6960
980 DATA 835,467,447,887,600,265,788,2
05,320,948,261,532,785,279,234,7853
1130 DATA 281,789,850,801,664,625,29,2
02,883,903,446,374,649,906,716,9118
1270 DATA 741,688,954,894,515,739,223,
669,964,755,497,793,891,559,292,10174
1390 DATA 559,287,556,598,365,25,37,36
4,562,295,652,290,559,509,919,6577
1540 DATA 881,74,776,817,425,394,503,6
10,629,765,721,373,533,634,773,8908
1700 DATA 721,534,531,632,774,520,806,
374,304,859,299,371,698,7,358,7788
1850 DATA 875,422,870,538,517,136,740,
808,560,306,609,308,577,435,371,8072
2000 DATA 46,355,664,100,686,243,802,6
05,494,866,44,197,319,261,788,6470
2150 DATA 540,286,311,288,544,620,174,
296,533,798,659,668,794,290,541,7342
2300 DATA 655,664,841,793,847,899,826,
143,375,121,779,603,491,574,552,9163
5110 DATA 884,793,483,818,500,869,380,
92,515,797,746,633,901,861,887,10159
5260 DATA 528,960,684,124,577,537,118,
101,548,62,873,770,798,72,780,7532
5410 DATA 383,25,850,546,284,558,129,7
62,567,748,456,699,695,436,276,7414
5560 DATA 497,272,730,549,125,144,534,
2851
```

•

Listing 2.

```
100 REM PROGRAM TO CHECK DATA
110 REM FOR PRINTER DRIVER MAKER
120 REM
130 REM BY C.D. WELKER
140 SIZE=0
150 GRAPHICS 1:? #6;"CHECKING DATA"
160 TRAP 280
170 LINE=5000
180 FOR X=1 TO 10
190 SIZE=SIZE+1
200 READ BYTE
210 TOTAL=TOTAL+BYTE
220 IF TOTAL>999 THEN TOTAL=TOTAL-1000
230 NEXT X
240 READ CHKSUM
250 IF TOTAL<>CHKSUM THEN GRAPHICS 0:?
 "DATA ERROR ! ";"LINE=";LINE;" TOTAL=
";TOTAL:? "CHECKSUM=";CHKSUM:END
260 LINE=LINE+10
270 GOTO 180
280 IF PEEK(195)=6 THEN ? #6;"DATA OK!
":PRINT #6;"PLEASE WAIT":PRINT #6;"DAT
A LISTED TO":PRINT #6;"D:DATA.LST"
285 GOTO 310
290 ? "DATA ERROR:";PEEK(195):END
310 LIST "D:DATA.LST",5000,6000
```

•

CHECKSUM DATA.

(see page 24)

```
100 DATA 904,560,80,146,697,763,734,95
9,150,252,123,924,966,769,282,8309
250 DATA 493,425,730,769,721,549,93,37
80
```

•

Listing 3.

```
300 REM LOADER PROGRAM TO CREAT A BOOT
 TAPE
390 STSIZE=641
1950 REM MAKE BOOT TAPE FILE
1980 GRAPHICS 17:PRINT #6:PRINT #6;" R
EADY YOUR ":PRINT #6;" CASSETTE"
1990 PRINT #6:PRINT #6;" PRESS RETURN"
:PRINT #6;" TO CONTINUE"
2000 PRINT #6:PRINT #6;" A BOOT TAPE":
PRINT #6;" WILL BE MADE"
2010 REM
2020 REM
2030 CLOSE #2:OPEN #2,8,128,"C"
2050 REM
2060 A$=A$(7)
2070 ? #2;A$
2080 REM
2100 GRAPHICS 17:PRINT #6:PRINT #6;" T
HE BOOT TAPE  ":PRINT #6;"  IS MADE"
4980 DATA 255,255,0,46,20,46,0,5,236,4
5,628
4990 DATA 0,46,169,60,141,2,211,169,11
3,133,691
5000 DATA 10,169,228,24,96,234,160,34,
185,25,400
5600 DATA 234,0,0,0,0,0,0,0,0,0,961
5605 REM
5610 REM * 641 BYTES
```

•

CHECKSUM DATA.

(see page 24)

```
300 DATA 23,974,367,230,506,685,278,27
9,706,282,669,432,285,119,812,6647
4990 DATA 958,163,647,311,534,2613
```

•

Listing 4.
Assembly listing.

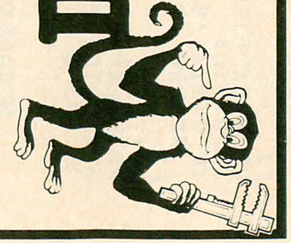
```
;PROGRAM TO INPUT PRINTER CODES
;ATARIWRITER AND NON-ATARI PRINTERS
;USE WITH MODE II OF ATARI WRITER
;
;BY C.D. WELKER
;
;EQUATES
;-------
;
FROM     =   $CC       ;ZERO PAGE ADDRESS
TO       =   $CE       ;DEDICATED TO USERS
HANTAB   =   $031A     ;HANDLR ADD TABLE
LOMEM    =   $02E7
;
;OFFSET TO BUMP LOMEM
;
LENGTH   =   PROGEND-BEGIN
LSBLEN   =    <LENGTH
MSBLEN   =    >LENGTH
WRITE    =   TABLE+15 ;INDIR JMP OS
```

```
;
;MAKE AN ARTIFICIAL JSR WITHIN
;THE CODE BY USING THE STACK
;AND RTS TO GET BACK TO UNLINE
;
OFFSET   =    A7-BEGIN
LSBOFF   =    [ <OFFSET]-1
MSBOFF   =     >OFFSET
;
;ARTIFICIAL JSR FOR STOPUL
;
;THE PRINTER ADDRESS TABLE:
;
;TABLE +1,2        OPEN ROUTINE -1
;TABLE +3,4        CLOSE ROUTINE -1
;TABLE +5,6        READ (NOT USED)
;TABLE +7,8        WRITE (TO ULINE-1)
;TABLE +9,10       DEVICE STATUS-1
;TABLE +11,12      NOT USED
;TABLE +13,14,15 JMP INITIAL
;TABLE +16,17      WRITE-1 O.SYSTM
;
;USE BOTTOM OF STACK FOR THE
;DEVICE TABLE *** NOT GOOD PRACTICE
;BUT I NEED A FIXED TABLE FOR
;RELOCATABLE CODE
;
TABLE    =    $0101
TEMP2    =    TABLE+19
TEMP     =    TABLE+21
FLAG1B   =    TABLE+23
FLAG2    =    TABLE+25
FLGSUB   =    TABLE+27
FLGSUP   =    TABLE+29
MEMLO    =    TABLE+33
ULFLAG   =    TABLE+35
;
         *=   $2E00
;
;MEMORY $2E00 IS A HIGH TEMPORARY MEMORY
;LOCATION. THE PROGRAM WILL RELOCATE ITSELF
;TO LOMEM AFTER LOADING.
;
;PROGRAM TO READ THE HANDLER ADD TABLE
;FOR THE PRINT LOCATION AND TO AUTOMATICALLY
;PUT THE CODING INTO THE PROGRAM FOR THE
;VARIOUS ADDRESSES. THIS IS TO ENABLE THE
;UNDERLINER PROGRAM TO BE COMPATIBLE WITH
;VARIOUS OPERATING SYSTEMS. THIS REQUIRES
;SELF MODIFING CODE.
;
;READ HANDLER SEARCH FOR "P"
;---------------------------
;
START     LDY #34
LOOP1     LDA HANTAB-1,Y ;SEARCH TABLE
          CMP #'P       ;IS IT "P"
          BEQ PLOC      ;YES. SKIP REST
          DEY           ;NO GET NEXT ONE
          BNE LOOP1     ;END OF TABLE? NO.
;
;STORE THE OS ADDRESS IN THE
;HANDLER ADDRESS TABLE FOR P
;---------------------------
;
PLOC      STY TEMP2     ;HOLD Y FOR USE LATER
          SEC           ;GET READY TO -1
          LDA HANTAB,Y ;GET LOW BYTE
          SBC #1        ;STORE ADD -1
          STA FROM      ;ZERO PAGE LO BYTE
          INY           ;GET HI BYTE
          LDA HANTAB,Y ;GET HI BYTE
          STA FROM+1    ;ZERO PAGE HI
;
;READ THE ADDRESSES IN  HANDLER ENTRY
;POINT TABLE  POINTED TO BY "P" IN HANDLER
;ADDRESS TABLE. NOTE THESE ARE THE
;ADDRESSES-1 OF THE ROUTINES FOR THE
;PRINTER FUNCTIONS: OPEN, CLOSE, ETC.
;
;SET UP MOVE TO TABLE
;--------------------
;
          LDA # <TABLE-1 ;LSB TABLE
          STA TO
          LDA # >TABLE-1 ;MSB TABLE
          STA TO+1
          LDY #15       ;DO 15 BYTES
LOOP2     LDA (FROM),Y
          STA (TO),Y
          DEY
          BNE LOOP2     ;GET THE NEXT ONE
;
;READ LOMEM AND STORE
;
          LDA LOMEM
          STA MEMLO
          LDA LOMEM+1
          STA MEMLO+1
;
;MODIFY HANDLER ADDRESS TABLE
;TO POINT TO TABLE OF VECTORS
;----------------------------
;
          LDY TEMP2
          LDA # <TABLE
          STA HANTAB,Y
          INY
          LDA # >TABLE
          STA HANTAB,Y
;
;MOVE WRITE ADDRESS TO OS FROM
;TABLE 7,8 TO TABLE 16,17
;ADD ONE TO LSB FOR RIGHT JMP
;-----------------------------
;
          CLC
          LDA TABLE+6
          ADC #1
          STA TABLE+16
          LDA TABLE+7
          ADC #0
          STA TABLE+17
;
;CHANGE WRITE ADDRESS IN TABLE
;TO POINT TO THE UNDERLINE CODE
;AT ADDRESS=PRESENT LOMEM-1
;STORED IN MEMLO
;
          SEC
          LDA MEMLO     ;LSB OF LOMEM
          SBC #1        ;SUBTRACT
          STA TABLE+6 ;POINTER LSB
          LDA MEMLO+1 ;MSB OF LOMEM
          SBC #0
          STA TABLE+7 ;MSB OF POINTER
;
;INSERT JMP COMMAND TO
;TABLE AT TABLE + 15
;
          LDA #$4C      ;JMP WRITE
          STA TABLE+15
;
;BUMP LOMEM UP TO PROTECT PROGRAM
;--------------------------------
;
          LDA #LSBLEN
          STA FLAG1B
          LDA #MSBLEN
          STA FLAG1B+1
          CLC
          LDA FLAG1B
          ADC MEMLO
          STA LOMEM
          LDA MEMLO+1
          ADC FLAG1B+1
          STA LOMEM+1
;
;NOW ZERO THE FLAGS
;
          LDA #0
          STA FLAG2
          STA FLAG2+1
          STA FLAG1B
          STA FLAG1B+1
          STA TEMP2
          STA TEMP2+1
;
;MOVE CODE TO LOMEM
;-----------------
;
          LDA # <BEGIN ;START ULCODE
          STA FROM
          LDA # >BEGIN
          STA FROM+1
          LDA MEMLO     ;LSB LOMEM
          STA TO
          LDA MEMLO+1 ;MSB LOMEM
          STA TO+1
;
;NOW MOVE THE CODE
;
          LDX #MSBLEN
          LDY #0
LOOP3     LDA (FROM),Y
          STA (TO),Y
          DEY
          BNE LOOP3
          INC FROM+1
          INC TO+1
          DEX
          BEQ LOOP3
          RTS
;
;CONVERT ATARI 825 CHARACTERS
;TO PRINTER CONTROL CHARACTERS
;----------------------------
;
BEGIN     STA TEMP      ;STORE CHAR
          CMP #$1B      ;CHECK IF CONTROL
          BNE TESTFG    ;WAS PREVIOUS $1B
          LDA #1        ;CHAR IS $B1 THE ESC
          STA FLAG1B    ;CHAR SO SET FLAG1B
          LDA TEMP
          JMP WRITE     ;PRINT ESC CHAR
TESTFG    LDA FLAG1B    ;$1B LAST ?
          CMP #1
          BEQ CONTSTEP ;2 HOPS TO CONTROL
A0        LDA TEMP      ;NO
          CMP #$0F      ;CHK IF START UL CHAR
          BEQ ULSTEP    ;TWO BRANCHES UNLINE
          CMP #$0E      ;NO CHK IF STOP UL
          BEQ STULSTEP ;2HOPS TO STOP UL
          CMP #$5C      ;"\" SUBSCRIPT KEY
          BNE A3
          LDA FLGSUB    ;TEST FLAG ON OR OFF
          CMP #1
          BEQ B1        ;FLG ON SO TURN FUNC OFF
          LDA #1        ;TURN FLAG ON
          STA FLGSUB
          CPY #$1B      ;ESC SET SUBSCRIPT
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
B1        LDA #0        ;TURN OFF SUBSCRIPT
          STA FLGSUB
          CPY #$1B      ;TURN OFF  SUBSCRIPT
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
A3        CMP #$5E      ;"^" SUPERSCRT KEY
          BNE A4
          LDA FLGSUP    ;TEST FLAG ON OR OFF
          CMP #1
          BEQ B2        ;FLG ON SO TURN FUNC OFF
          LDA #1        ;TURN FLAG ON
          STA FLGSUP
          CPY #$1B      ;ESC SET SUPERSCRIPT
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
;
;STEPPING STONES FOR LONG BRANCH
;
          CLC
          BCC B2
CONTSTEP BEQ CONTROL
ULSTEP    BEQ UNLHOP    ;THREE HOPS
STULSTEP BEQ STPHOP    ;THREE HOPS
B2        LDA #0        ;TURN OFF SUPSCRIPT
          STA FLGSUP
          CPY #$1B      ;TURN OFF SUPERSCRIPT
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
          NOP
A4        CMP #$5B      ;"[" UL BLANKS ALSO
          BNE B3
          LDA #1        ;SET ULFLAG *ON*
          STA ULFLAG
          LDA #0        ;FORCE BRANCH
          BEQ UNLHOP    ;UL ALL
B3        CMP #$5D      ;"]" STOP UL ALL
          BNE A5
          LDA #0        ;RESET ULFLAG *OFF*
          STA ULFLAG
          BEQ STPHOP    ;STOP UL ALL
A5        CMP #$20      ;MARGIN PRINT NO UL
          BNE A6
          JMP WRITE
```

```
A6       LDA ULFLAG
         CMP #1
         BNE A7
;
;MAKE AN ARTIFICIAL JSR FOR
;RELOCATABLE CODE BY USING THE
;STACK TO RETURN TO LABEL A7
;ALLOWS A RELOCATABLE JSR TO
;THE UNLINE ROUTINE
;
         CLC
         LDA MEMLO
         ADC #LSBOFF
         STA TEMP2
         LDA #MSBOFF
         ADC MEMLO+1
         STA TEMP2+1
         PHA            ;MSB OFFSET TO A7 ON STACK
         LDA TEMP2
         PHA            ;LSB OFFSET TO A7 ON STACK
         LDA #0         ;FORCED BRANCH TO
         BEQ UNLHOP     ;UNLINE SUBROUT
;
;ALL TESTS FAIL SO PRINT CHAR
;
A7       LDA TEMP       ;GET CHAR
         JMP WRITE      ;PRINT IT
;
;STEPSTONES FOR LONG BRANCHES
;
UNLHOP   BEQ UNLJMP
STPHOP   BEQ STPJMP
;
CONTROL  LDA #0         ;ZERO FLAG1B
         STA FLAG1B
         LDA TEMP       ;COMPARE SELECT 10CPI
         CMP #$13
         BNE SKIP2
         CPY #$21       ;SET DEFAULT MODE
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
SKIP2    CMP #$0F       ;CHECK STOP DOUBLE
         BNE SKIP3      ;WIDE PRINT CONTROL
         CPY #$57       ;STOP  EXPAND MODE
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
;
;****************************
;CHK IF ITS CARRIAGE RETURN
;USE FLAG2 TO DIVIDE BY TWO
;SINCE HALF LINES ARE SENT
;****************************
;
SKIP3    CMP #$1C       ;ATARI CR 1/2
         BNE SKIP5
         LDA FLAG2      ;CARR RETURN FLG
         CMP #1         ;IS IT SECOND TIME
         BNE SKIP4
         LDA #0
         STA FLAG2      ;ZERO FLAG FOR CR
         LDA #1         ;CHAR ESC/1/=NOTHING
         JSR WRITE      ;ALLOWS $0A TO WORK
         LDA #$0A       ;LINEFEED
         JMP WRITE
SKIP4    LDA #1         ;SET FLAG2
         STA FLAG2
         LDA #1         ;NULL DO NOTHING
         JMP WRITE
SKIP5    CMP #$14       ;SELECT CONDENSE
         BNE SKIP6
         CPY #$21       ;SET CONDENSED MODE
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
SKIP6    CMP #$11       ;SELECT PROPOR.PT
         BNE SKIP7
         CPY #$70       ;"p" SELECT PROPOR.PT
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
;
;STEPSTONES FOR LONG BRANCHES
;
UNLJMP   BEQ UNLINE
STPJMP   BEQ STOPUL
;
SKIP7    CMP #$0E       ;ATARI START
;
;DOUBLE WIDE  PRINT
;
         BNE SKIP8
         CPY #$57       ;START DOUBLE WIDE
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
;
;ALL ESC CKS FAIL PRINT CHAR
;
SKIP8    JMP WRITE
;
;********************************
;UNDERLINE ROUTINE ADD NOPS
;TO LEAVE SPACE OTHER PRINTERS
;********************************
;
UNLINE   CPY #$1B       ;UNDERLINE CODE
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
STOPUL   CPY #$1B       ;STOP UNDRLINE
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
         NOP
PROGEND  =   *
;
         *=  $02E2      ;INITIATE VECTOR
         .WORD START
         .END
```

●


# Monkey Wrench II



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# Color the Shapes

*continued from page 40*

```
FOR J=BOT TO TOP+9 DO
  IF R(J)=N THEN
    B(J)=COLOR
    FILLER(J)
  FI
OD
RETURN

PROC INIT()
BYTE K,J,M,N,C
ZERO(PLAYER,20)
ZERO(B,99)
ZERO(USED,60)
PUT(125)
PRINTE("1 OR 2 PLAYERS?")
PLAYNUM=INPUTB()
PRINTE("WHAT IS YOUR NAME?")
INPUTS(A)
FOR K=1 TO A(0) DO
  PLAYER(K)=A(K)
OD
IF PLAYNUM=2 THEN
  PRINTE("NAME OF 2ND PLAYER?")
  INPUTS(A)
  FOR K=1 TO A(0) DO
    PLAYER(K+10)=A(K)
  OD
FI
PUT(125)
PRINT("USE A KOALA PAD (Y/N)?")
CFLAG=0
INPUTS(A)
IF A(1)='Y THEN
  CFLAG=1
FI
PRINTE("FILL SOME SHAPES IN?")
INPUTS(A)
IF A(1)<>'Y THEN
  RETURN
FI
PUT(125)
PRINTE("HOW MANY SHAPES, UP TO 5?")
J=INPUTB()
J==MOD 6
FOR K=1 TO J DO
  DO
    M=RAND(COUNT-1)+1
    UNTIL USED(M)=0
  OD
  N=M
  DO
    N==+1
    UNTIL R(N)=M
  OD
  DO
    C=RAND(4)+2
    UNTIL GOOD_COLOR(N,C)=1
  OD
  COLOR=C
  FILL_IN(N)
  USED(M)=1
OD
RETURN

BYTE FUNC SGN(BYTE I,J)
IF I=J THEN
  RETURN(0)
ELSEIF I>J THEN
  RETURN(-1)
FI
RETURN(1)

PROC MOVE()
BYTE Q,DEL
CARD K
IF OLDX<>X THEN
  Q=OLDX
  DEL=SGN(OLDX,X)
  WHILE Q<>X DO
    PMMOVE(1,Q,OLDY)
    Q==+DEL
  OD
  OLDX=X
  FOR K=1 TO 2000 DO
  OD
FI
IF OLDY<>Y THEN
  Q=OLDY
  DEL=SGN(OLDY,Y)
  WHILE Q<>Y DO
    PMMOVE(1,X,Q)
    Q==+DEL
  OD
  OLDY=Y
FI
RETURN

BYTE FUNC TRIGGER()
IF CFLAG=1 THEN
  IF PEEK(636)=0 OR PEEK(637)=0 THEN
    RETURN(0)
  FI
ELSE
  IF STRIG(0)=0 THEN
    RETURN(0)
  FI
FI
RETURN(1)

BYTE FUNC ABS(BYTE A,B)
IF A>B THEN
  RETURN(A-B)
FI
RETURN(B-A)

BYTE FUNC JOYSTICK()
BYTE P,X1
IF CFLAG=1 THEN
  X1=PEEK(624)
  Y1=PEEK(625)
  IF X1<5 OR Y1<5 THEN
    RETURN(0)
  FI
  X1=56+(X1/28)*16
  Y1=36+(Y1/28)*16
  IF ABS(X1,OLDX)<5 THEN
    RETURN(0)
  ELSEIF ABS(Y1,OLDY)<5 THEN
    RETURN(0)
  FI
  X=X1
  Y=Y1
  RETURN(1)
FI
P=STICK(0)
IF P=15 THEN
  RETURN(0)
FI
IF P=11 AND OLDX>60 THEN
  X=OLDX-16
  RETURN(1)
ELSEIF P=7 AND OLDX<180 THEN
  X=OLDX+16
  RETURN(1)
ELSEIF P=14 AND OLDY>51 THEN
  Y=OLDY-16
  RETURN(1)
ELSEIF P=13 AND OLDY<152 THEN
  Y=OLDY+16
  RETURN(1)
FI
RETURN(0)

BYTE FUNC COMPLETE()
BYTE J
FOR J=1 TO COUNT-1 DO
```

```
   IF USED(J)=0 THEN
     RETURN(0)
   FI
OD
RETURN(1)

PROC NAME()
BYTE J
PUT(125)
FOR J=TURN*10+1 TO TURN*10+10 DO
   PUT(PLAYER(J))
   IF PLAYER(J+1)=0 THEN
     EXIT
   FI
OD
PRINTE("'S TURN")
RETURN

PROC COLOR_IN(BYTE SPOT)
BYTE K
CARD K1
IF B(SPOT)<>0 THEN
  DO
    UNTIL PICK_COLOR()<>0
  OD
  MOVE()
  IF QUIT=1 THEN
    RETURN
  FI
  X=OLDX
  Y=OLDY
  MOVE()
  RETURN
FI
IF GOOD_COLOR(SPOT,COL)=0 THEN
  BEEP()
  PRINT("YOU CANNOT USE THAT")
  PRINTE(" COLOR THERE")
  BEEP()
  RETURN
FI
COLOR=COL
FILL_IN(SPOT)
IF PLAYNUM=2 THEN
  TURN==! 1
FI
NAME()
FOR K1=1 TO 2000 DO
OD
RETURN

PROC SHAPES()
BYTE A,SPOT,J
DO
  TITLE()
  GRAPHICS(8)
  QUIT=0
  PMGRAPHICS(1)
  SETUP()
  POKE(705,22)
  POKE(623,160)
  PMCLEAR(1)
  MAKEPM(STAR,14,1,2,156,126)
  X=56
  Y=36
  OLDX=0
  OLDY=0
  MOVE()
  COLOR=3
  COL=3
  GRID()
  TURN=0
  SEARCH()
  CHECK_BOARD()
  INIT()
  NAME()
  DO
    IF TRIGGER()=0 THEN
      COLOR_IN(SPOT)
    FI
    IF JOYSTICK()=1 THEN
      MOVE()
    FI
    SPOT=(X-38)/16+10*(Y-36)/16
    UNTIL COMPLETE()=1 OR QUIT=1
  OD
  IF COMPLETE()=1 THEN
    FOR J=TURN*10+1 TO TURN*10+10 DO
      PUT(PLAYER(J))
      IF PLAYER(J+1)=0 THEN
        EXIT
      FI
    OD
    PRINTE(" IS THE WINNER")
  FI
  PRINTE("PLAY AGAIN?")
  A=INPUTB()
  UNTIL A='N
OD
RETURN
```

•


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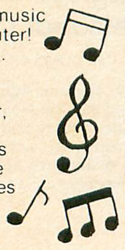

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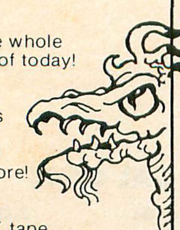

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**by Randy Mumford**

**Dragonriders of Pern** from Epyx is the official computer game based on the popular series of fantasy novels by Anne McCaffrey. It has eight screens and two different styles of play.

The first three pages of the **Riders** instruction manual provide a brief synopsis of the novels. This not only sparks your interest in the game, but also makes you eager to read the books. The remainder of the thirteen-page manual guides you through the game setup, strategy and threadfighting sequences. Instructions are quite comprehensive, except for one item. Going on search for new **Dragonriders**, while mentioned in the glossary, was never explained in the manual.

**Riders** will accommodate four players represented by "weyrs" (groups of dragons and riders), with the computer controlling two additional weyrs. One nice feature allows you to choose between the standard game (both strategy and action phases), strategy only, or threadfighting practice. Speed is selectable (slow, average and fast) and affects both phases of the game. Game length is also selectable, from one to ninety-nine turns.

In the negotiation/intrigue phase, you must make allies of Holds and Crafthalls to gain help in your fight against the infestation of a life-form called Thread, from a wandering red planet that passes near Pern on a regular cycle. You can call up character profiles of Lord Holders and Craftsmasters, to aid in determining how to deal with each one.

This phase can be played with joysticks, paddles or keyboard . . . a handy feature if you have less than four joysticks.

The first screen (Events) displays the character profiles when they're called up, events taking place or scheduled, and a list of all weyrs (players) with the number of wings of dragons available to each.

The Attitude screen lets you choose from five negotiating attitudes (from pleading through amiable to threatening) for your dealings with others.


**Dragonriders of Pern.**

The pace is relatively fast, even on the slow setting, but, fortunately, there is a pause feature (CTRL-P) when you're on the events screen. The victory status screen at the end of the sequence shows points acquired for each player. The game is over when one player gains twenty points, when twenty Holds are Thread infested, or when the chosen number of turns is completed.

In the threadfighting phase, all players must use a joystick in port 1. The level of difficulty increases as **Riders** progresses, and additional difficulty is provided for advanced players by a selectable depth of play.

These depths can be chosen from one to three, and are represented by three dimensions on the screen. A typical view of Pern's countryside is displayed, with falling Thread and a flying dragon.

The method used for dragon movement is awkward. The dragon is moved upward and downward by forward or backward motion of the joystick, and it is rotated in steps of one-quarter turn by left or right movement. Facing the dragon away from or toward you allows him to fly into the other dimensions of the screen, if multiple depths are chosen.

Pressing the fire button causes the dragon to breathe flame, burning the Thread from the sky before it reaches the ground. Depressing the SPACE BAR allows you to go "between," to escape Thread that is about to burn you or to cool burns already obtained.

I've never cared for the "bang the SPACE BAR" idea. Not only does it require a third hand, but it is potentially damaging to the keyboard with overly enthusiastic players.

When the threadfighting phase is finished, a results screen is displayed, indicating the number of dragons killed or wounded and the number of Thread that reached the ground in each Hold. The save game feature can be used at this point by pressing CTRL-S. It would be far more convenient if it were available at any point during game play.

**Dragonriders of Pern** is an engrossing game, though a little hectic even with the pause feature. Dragon movement is somewhat difficult at first, but gets easier with practice. The alternating strategy and action sequences make for an interesting combination and an enjoyable game. □

*Randy Mumford has worked as an Electrical Engineer for fourteen years. Since purchasing an Atari 800 two and one-half years ago, his interests have expanded to include adventure gaming, telecommunications, word processing, and database and spreadsheet usage.*

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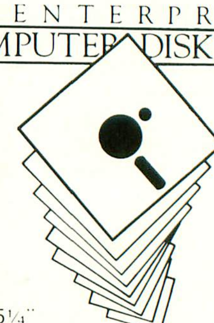

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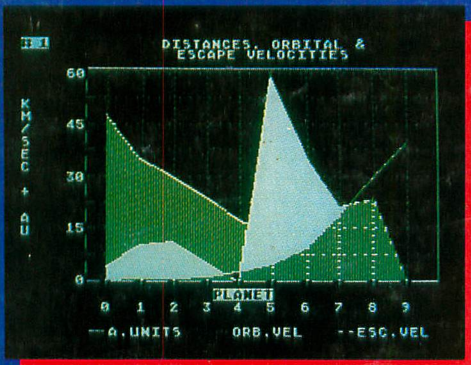


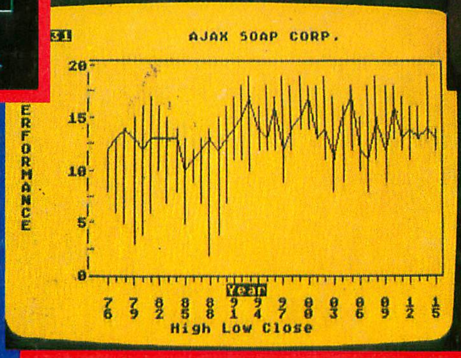


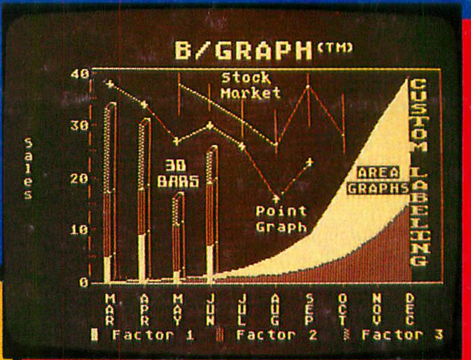


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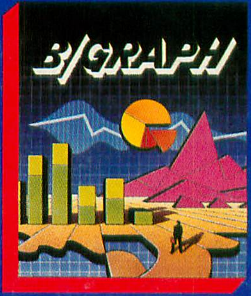


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