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# ANALOG COMPUTING

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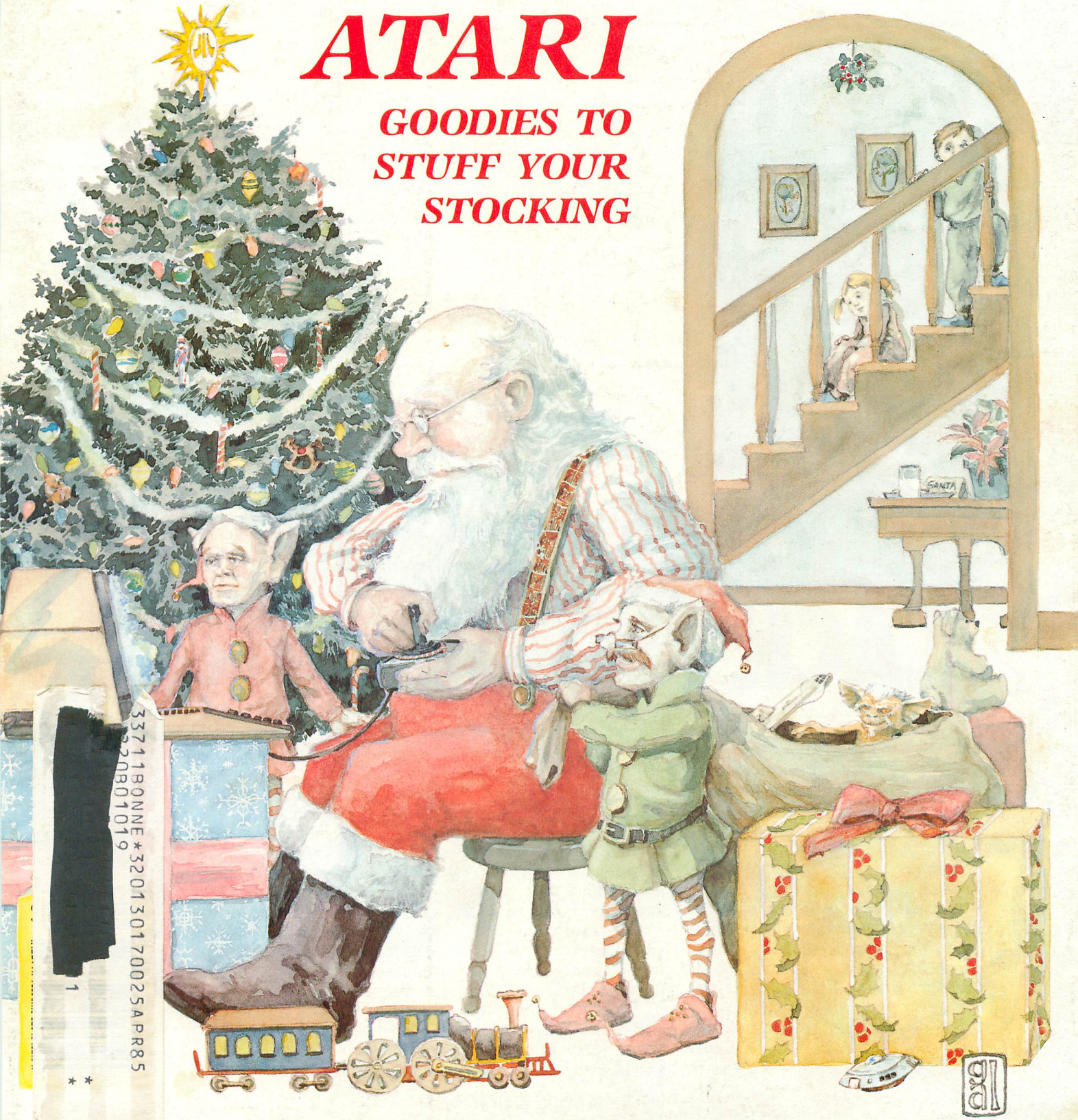


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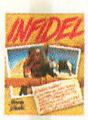


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# ANALOG COMPUTING

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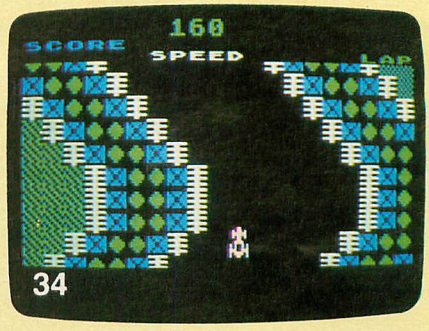


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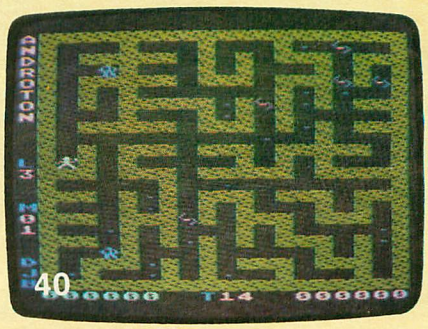


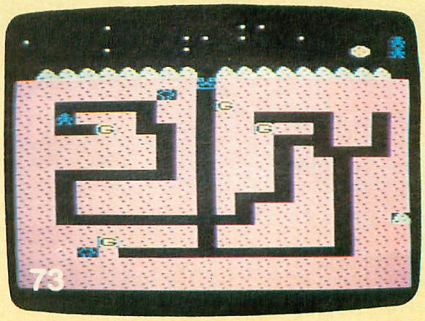


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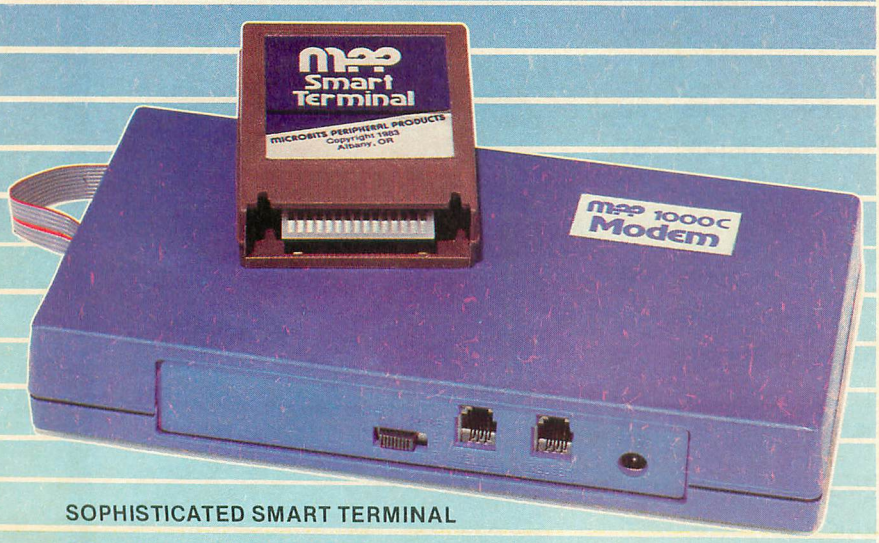


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# Editorial

by Jon A. Bell

Magazine lead time is an interesting phenomenon. I'm writing an editorial for the December issue (due out in November) just as the last warmth of Indian summer has fled New England. It's given way to gray skies, chill winds, falling multi-colored leaves and the smell of smoke—Bradbury weather.

What lead time forces an editor to do is to write for the future. Often, his or her predictions will be proven false in the time between the writing of an editorial and its publication. Nevertheless, one sometimes gets lucky when repeating announcements about products which, one hopes, will be released soon after the publication of the article. And, when your news concerns Atari Corporation rising, phoenix-like, from the ashes of corporate short-sightedness, people should sit up and take notice. Those people are our readers.

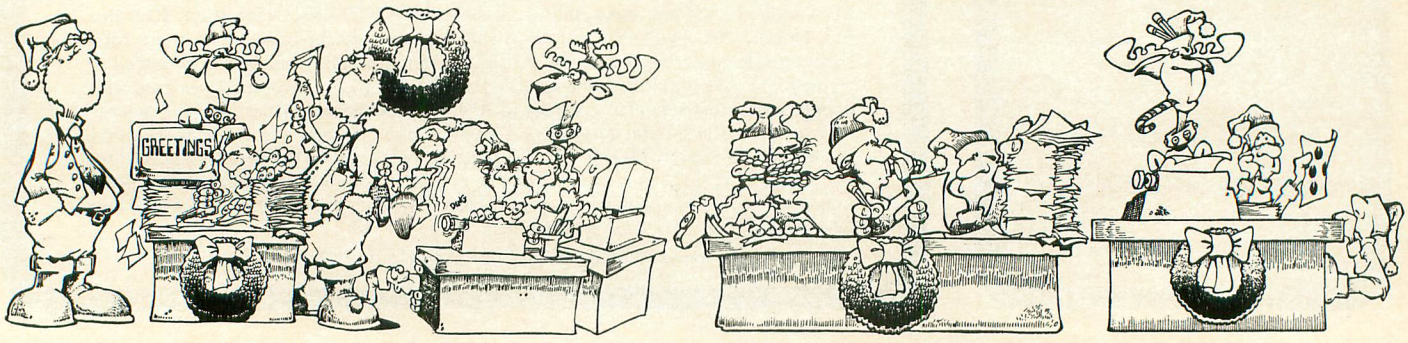
In the October 8th issue of *Forbes* is an article on Jack Tramiel and his plans for the revitalization of Atari. Tramiel conducted a closed-door meeting with a group of venture capitalists at the Mark Hopkins Hotel in San Francisco on September 13th. Tramiel plans to raise $50 million by the selling of debentures, enabling backers to convert these into a small percentage of Atari stock, worth millions if and when Atari goes public. Tramiel also asserted that he would build Atari's sales from the present $500 million to over $1 billion by the end of 1985 and—the battle cry of the new Atari—announced an entirely new product line, most of which should be introduced early next year.

As I mentioned in the editorial of our October issue (23), second-guessing the computer industry is not an enviable task. We have endeavored not to print rumors unless we received confirmation through a number of reputable sources. Nevertheless, I think that enough has been said in the pages of *Forbes*, the *Wall Street Journal*, *InfoWorld* and the irreverent (but always fascinating) *Jeffries Report* to justify speculation in our pages.

The first of the (rumored) products, due in time for Christmas and the mad retail rush, is an expanded 800XL. No further word has come on the 600XL, although it's likely to be dropped. The new 800XL is supposed to have 128K (bank-selectable) and a stereo sound chip. Another product mentioned is a printer for under $100.00. The most exciting news, however, is what we've heard about Atari's higher-end computer systems. Insiders report the lights burning late at night, as Atari tries to whip up two computer systems in time for showing at the January Consumer Electronics Show. The first machine is reported to be a 16-bit computer, to be priced above the 800XL. The second machine is reportedly a 32-bit Macintosh work-alike, with a shockingly low price.

Speaking of 32-bit machines, many observers see Tramiel's lawsuit against Amiga as merely a delaying tactic. If Tramiel does indeed have a 68000-based machine waiting in the wings, slowing down the release of the Amiga-built machine might enable him to get the edge over Commodore.

Finally, if Tramiel can manufacture a 68000-based computer which will function as a Macintosh emulator *and* offer it at a rock-bottom price, he will have performed two business miracles. The first was to take a faltering typewriter company (Commodore) and turn it into a billion-dollar-a-year home computer company. The second would be to take a company that suffered the worst financial setback since Chrysler and sent it rocketing back to success. That would be Atari, and that's what we've been waiting for. □



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# READER COMMENT

### BBS correction.

*In issue 23's* ***Reader Comment*** *(page 7), we gave an incorrect phone number for H.A.C.E. (or Houston Atari Computer Enthusiasts). Paul Mitchum, the reader who originally brought the Texas BBS (and others) to our attention, caught this error and asked that we print the following, correct number for H.A.C.E.:*

*713-644-6400*

*Sorry, Paul.* —*Ed.*

---

### Atari BASIC Revision C.

I have not seen information on Revision C of Atari BASIC in your magazine. I tried the BASIC bug described in issue 23, page 56 with the Revision C Atari BASIC, and the bug does not exist any more.

Revision A is the cartridge that came with the Atari 800 or was purchased for the Atari 400. Revision B is the built-in BASIC for the Atari 600XL or 800XL. Revision C is a new cartridge that can be obtained from Atari Customer Relations at a cost of $15.

You can determine the version of Atari BASIC you have by examining location 43234 with the PEEK command.

| Revision | Value |
|---|---|
| A | 162 |
| B | 96 |
| C | 34 |

To order your own copy of the Revision C Atari BASIC, request part number CA024948-001 and send $15 to this address:

Atari Customer Relations
1312 Crossman Ave.
P.O. Box 61657
Sunnyvale, CA 94088

Sincerely,
Allan Frink
Lino Lakes, MN

---

### Yet another BBS.

Please tell your readers of a new BBS called T.R.A.I.N. BBS, Ennis, Texas at 214-875-9818.

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Call 214-875-9818 5:00 pm till midnight, or anytime on Saturdays. There is a password contest for all computers.

My thanks to you for having a great Atari magazine.

Brady Mooney
SYSOP
Ennis, TX

---

I've been using the **ANALOG Card File** to organize my magazine collections. While using it, I have encountered one problem.

I have a RANA 1000 disk drive, and it has a protect switch that I've accidentally turned on when inserting the disk a couple of times. It got me frustrated when I hit the START button to save the screen, and—because of the protect feature—the program encountered an error and went to the menu screen, destroying the card.

I changed and added some lines to fix this problem. The program will beep if the disk is protected, if there isn't enough memory, or if any other error occurs during disk I/O.

The changes I made are as follows:

```
150 IF PEEK(53279)=3 THEN
POKE 752,K1:? "↑";:TRAP 50
00:GOTO 1000
5000 ? "■":FOR Z=1 TO 5:NE
XT Z:? "■":GOTO 130
```

With these changes, I don't have any disk-error problems that destroy my cards.

Sincerely,
Mark Grande
Willow Grove, PA

---

Selling my smaller 5K computer and getting my Atari 600XL was as exciting as typing in my very first program and seeing it RUN.

I then, of course, got the "bug" and started buying every back issue of **ANALOG Computing** that I could.

The game programs and utilities kept me busy at the keyboard, but sooner or later I wanted to try the features in magazines that started "for Atari computers with a minimum of 24 or 32K." At this point, there were no RAM expansions yet available for the 600XL.

While paging through an issue with hopes of finding a 16K listing for a game, I spotted a very small ad. . ."600XL expansion module, 32K (48K total), $99.95."

The ad (R.C. Systems) prompted a phone call to Bothell, Washington. The price was so reasonable that I was curious. After gaining assurance that this unit had been

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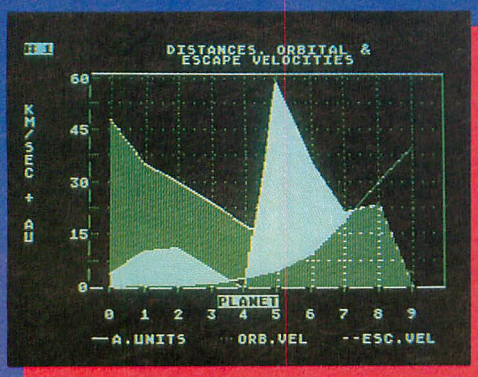


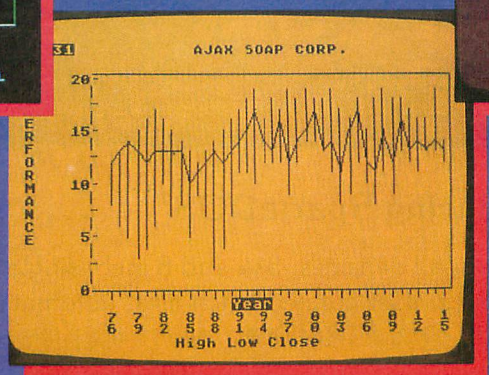


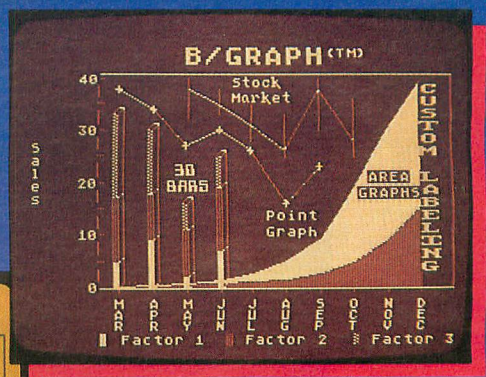


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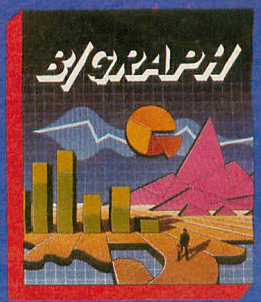


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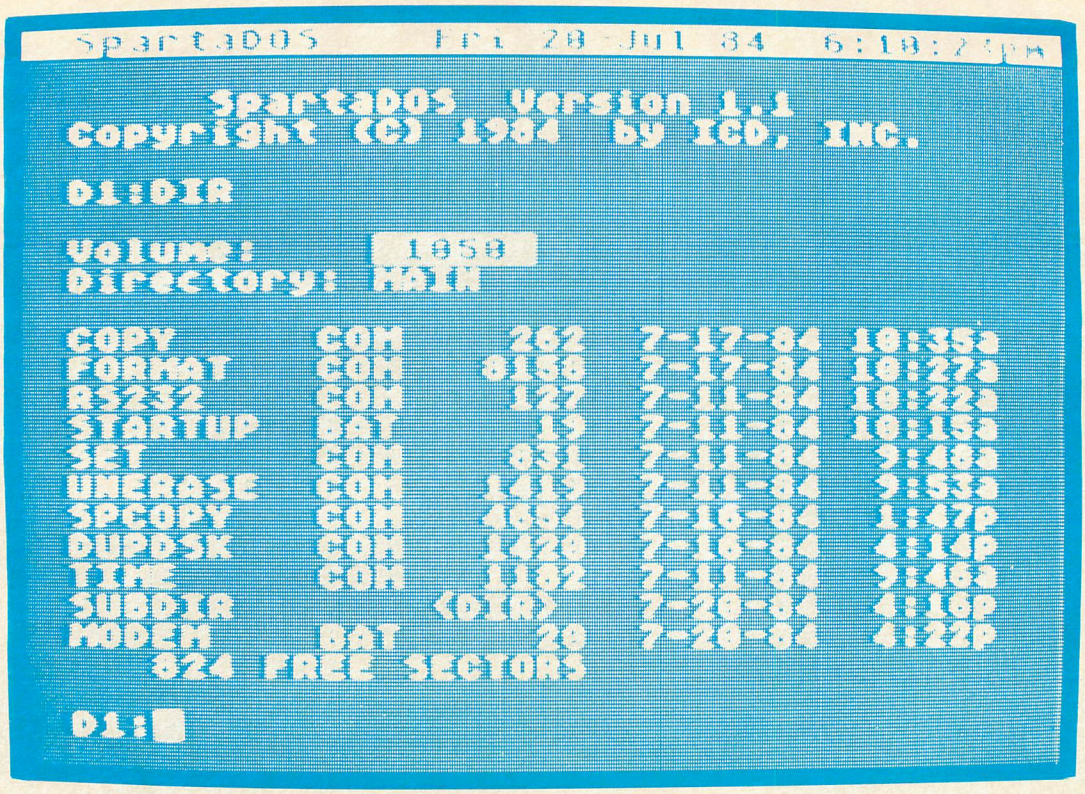


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tested and retested, and that the price was, indeed, $99.95, I ordered the expander.

When it arrived, I found the surprise of a lifetime—a 32K module weighing less than 3 ounces and measuring 4½" x 1¾" x ¾". And its color matched my 600XL to a "T."

I followed the simple instructions and CLOADed a 32K game tape. It ran, and the expander did everything it was supposed to do—and more.

I am happy that I didn't wait for larger (and, I'm told, bulkier) expanders that would have cost more.

Congratulations, R.C. Systems and **ANALOG Computing** from a very satisfied computer hobbiest.

Milson Luce
Kenner, LA

---

I'm an Atari 800 user and a data processing professional who is hooked on the C programming language. If you want an excellent programming language, read on. . .and if you already use C on an Atari, please drop me a line, so we can swap functions and tricks.

Here are three very good reasons to program in C:

1. In the business world, a lot of people are making big bucks writing in C. AT&T and IBM are betting that C will be the language of the future for business micros, and a lot of IBM followers are already on the bandwagon. The problem is that there aren't very many C programmers out there. So lately, in the computer industry's trade journals, there have been a lot of ads for programmers knowledgeable in C and UNIX—offering salaries at $30-$50,000! And this is with little other DP experience. A BASIC, assembler or COBOL programmer is lucky to get a job for half that much.

2. It's a high-level language that produces compiled code which runs rings around BASIC programs, yet is infinitely easier to use than assembler.

3. It has many of the familiar BASIC verbs, like PEEK and POKE, as functions that are used in a similar fashion. Yet—since these functions are written in C, and you are provided the source code—you can make them act differently by modifying the C code.

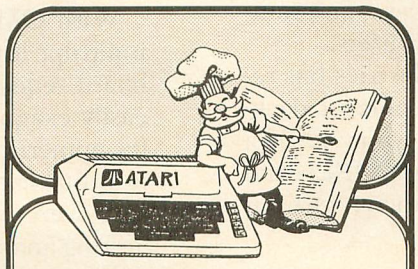
So, if you want to program in the language of the future—that uses many of your favorite BASIC verbs, that allows modular development, that produces fast programs, and that costs very little—buy a copy of *Deep Blue C*. Then write to me, Don Vuckovich at: Friends of the C, 584 Crescent Ave., East Aurora, NY 14052.

Don Vuckovich
East Aurora, NY

---

# Reader Comment

*continued on page 82*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**For the 800XL**

by Tom Hudson

When the Atari 800XL computer appeared late in 1983, many people were disappointed by its apparent lack of expandability. Gone were the handy expansion slots of the old 800. . .and, with them, everyone thought, went the chance to enhance the basic computer easily.

For serious Atari users, like the **ANALOG Computing** technical staff, the 800XL was a letdown. I remember looking at the sleek machine, shaking my head and saying, "I'd love to have this on my desk, but without OMNIMON! I just couldn't function." If you've been reading **ANALOG Computing** for very long, you'll remember that OMNIMON! (reviewed in issue 12) is a resident monitor which can be called with a simple keyboard sequence. This program is indispensable for serious machine-language programmers, as well as other advanced Atari users.

Luckily for 800XL users, Newell Industries has recently introduced **Ramrod XL**. This compact package contains three improvements for your 800XL: OSNXL, FASTCHIP XL AND OMNIMONXL—and **Ramrod XL** is capable of being enhanced with an 80-column screen editor.

### A new OS.

The first feature present in **Ramrod XL** is OSNXL, a revised operating system for the 800XL. This OS operates in the same way as the original, but with several improvements which make living with your 800XL much easier.

First, the keyboard response is twice as fast as the standard OS. Many people have written patches that perform this function for the 400/800 operating systems, but it's already built into OSNXL. This is a convenient feature for those who type faster than normal or who use the cursor control keys often.

The cassette interface has been improved, so that the data transfer rate can be increased by the user. The **Ramrod XL** manual reports baud rate increases to around 1500 baud—2.5 times the standard speed! The baud rate can be changed via BASIC or machine language, and SYSTEM RESET returns it to the default of 600 baud.

OSNXL should be compatible with most existing software, since the authors kept the entry points at their Revision B locations.

### Faster math.

The second feature of **Ramrod XL** is the FASTCHIP XL, an enhanced floating-point subroutine package. You don't have to be an advanced programmer to use or appreciate this feature.

FASTCHIP XL replaces the built-in math subroutines in the 800XL, resulting in math functions that operate an average of four times faster than the original. Figure 1 shows typical math functions and the processing time for 1000 repetitions in BASIC on the standard OS and OSNXL with FASTCHIP XL.

| FUNCTION | STANDARD | FASTCHIP XL | SPEED INC |
|---|---|---|---|
| ADDITION | 5.19 | 5.02 | 1.034 |
| SUBTRACT | 5.43 | 5.38 | 1.009 |
| MULTIPLY | 13.32 | 7.95 | 1.675 |
| DIVIDE | 9.96 | 9.51 | 1.047 |
| EXPONENT | 233.67 | 74.55 | 3.134 |
| SQ.ROOT | 96.92 | 41.23 | 2.351 |
| LOG | 128.38 | 49.03 | 2.618 |

**Figure 1.**

As you can see, the FASTCHIP XL can make life easier—even for the novice user who only uses BASIC. **Solid States** fans, take note!

### The resident monitor.

The last major feature of **Ramrod XL** is my personal favorite, OMNIMONXL. This is a "must-have" for any assembly language programmer.

With OMNIMONXL in your computer, you can interrupt a program at any time with a simple keyboard sequence. Once in OMNIMONXL, you can easily examine and change memory. You can search for numeric or text data in memory. Hex conversion is available at any time. You can disassemble memory and even *assemble* 6502 instructions into memory! Testing and debugging of assembly language programs will be much easier with OMNIMONXL resident in your computer.

**The Ramrod XL** package itself is a simple circuit board which installs quickly in your 800XL. I installed our unit in about ten minutes, most of this time being spent searching for the tools! The only equipment you need for the installation is: a couple of screwdrivers, pliers and a drill.

After the computer is opened, the old operating system chip is removed, and the **Ramrod XL** board is plugged into the OS chip socket. Then the old OS chip is inserted into one of the three sockets on the **Ramrod XL** board. Finally, you'll want to install the OS selector switch in the 800XL case. Do this by drilling a small hole in the back of the computer.

Once **Ramrod XL** is installed, you have the option of using the standard operating system or OSNXL. You simply flip the OS selector switch from one position to another to perform this function. With the old OS selected, your 800XL will perform as it always did before the modification.

With OSNXL selected, you have the new OS func-

tions, FASTCHIP XL and OMNIMONXL, available for your use. Interestingly, OSNXL was designed to set the default blue of the screen to a slightly darker shade. This was done so that you could easily determine which operating system has been selected.

As mentioned earlier, the **Ramrod XL** board contains three sockets. One holds the original 800XL OS, the second contains the OSNXL chip and the third is available for a *third* operating system, if you like. The selector switch is a three-position type, allowing you to select any one of the three operating systems.

### OmniviewXL.

One interesting possibility available for the third OS socket is **OmniviewXL**, an 80-column upgrade for the 800XL. This is a single chip which installs in the **Ramrod XL** board in minutes, requiring no further hardware changes to the 800XL.

**OmniviewXL** creates an 80-by-24-character display for your 800XL, using the graphics 8 mode. This is a fairly good solution to the 80-column problem, and **OmniviewXL** uses it nicely. Due to careful color selection, the characters are quite legible on a properly-adjusted color display. Of course, the 80-column output looks best on a monochrome monitor.

When the computer is powered on with **OmniviewXL** selected, it will default to the normal 40-column mode. The 80-column display may be selected in one of two ways: pressing OPTION, SELECT and RESET at the same time; or executing a JSR $C001 from assembly language.

According to the manual, **OmniviewXL** is compatible with any program which uses the normal, non-split-screen editor. Programs like **Medit**, **VisiCalc** and **AtariWriter** use custom screens, and won't operate properly.

With programs that can use **OmniviewXL**, there are a few things to remember. First, the **OmniviewXL** editor has a maximum logical line length of 80 columns, not 120, as in the standard editor. You can still edit lines longer than 80 columns, by returning to 40-column mode. Second, you cannot set tabs in 80-column mode. Third, split-screen and line drawing are not supported by **OmniviewXL**.

Because the **OmniviewXL** screen is set up in graphics 8, there is a way to mix graphics and text on the screen—if your program can draw in graphics 8. The manual describes the technique, which, basically, allows text on the top of the screen and graphics on the bottom.

The manual also describes how to modify various versions of **Letter Perfect** and **Data Perfect** to work with **OmniviewXL**. This can be done easily with OMNIMONXL, or CDY Consulting will do the patches for you, for a $10.00 fee. □


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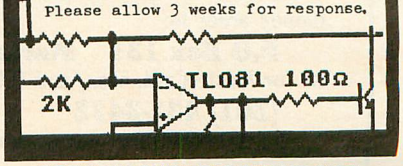


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by Ron Luks

Let me start out this review by stating for the record that, while I've talked countless times to a "person" named Russ Wetmore and know many folks who've met him face to face, I don't believe he exists. At least, not as *one* person. A secret group of some of the most talented machine language programmers *operating* under the name "Russ Wetmore," possibly, but no one person can be this good.

Of course, Russ really *does* exist, but when you get to see **Hometerm**, which is part of the new **Homepak** trilogy of programs he's written for the Atari, you'll see what I mean. Honestly, can one programmer be this good?

You'll be hearing a lot about **Homepak** in the coming weeks, I'm sure. **Hometext**, **Homefind** and **Hometerm**—all written in Action!—are, respectively, a word processor, a database program and the best terminal program ever written for the Atari. I haven't tested **Hometext** or **Homefind** at the time of this writing, so I can't comment credibly on them.

I have worked with **Hometerm** in what must be the most comprehensive testing and development periods for any terminal program written for the Atari—or any computer I'm familiar with. Since agreeing to be a beta-tester for this program, and fortunate enough to have made a few suggestions that have been incorporated into the final version, my testing logbook now shows me *personally* having used **Hometerm** over 1100+ on-line hours. That's not a misprint—*one thousand, one hundred plus on-line hours*—and that's not counting the testing of the others.

As the primary Sysop of SIG*ATARI, involved extensively with seven other CompuServe sigs and testing for CIS of products soon to be available (like XModem transfers), I find that a good terminal program isn't enough. A great terminal program is a working tool, not a luxury. A superb terminal program is rare indeed, but in my collection of over two dozen Atari terminal programs, I have two or three that meet the "superb" criteria. Only one, however, can be the best. **Hometerm** is, quite simply, the *best*.

At the risk of upsetting the folks who are going to bring **Homepak** to the market (and are surely going to be advertising all the user-friendly features of the series—and, from what I've seen in **Hometerm**, it is about the friendliest program I've come across in a long time), its user-friendliness is *not* what makes me give it the highest rating possible. In the last few years on SIG*ATARI, I've been "user-friendlied" to death. When I hear the words now, they actually scare me *away* from the product. Sure, user-friendly is nice. I like to boot up a program and run it without reading the instructions as much as the next person, maybe more. In my experience, such friendly programs are fine for the casual user, but very quickly such novice amenities show up as agonizing shortcomings. Copy protection makes patches a nightmare. (Did you ever curse **AtariWriter** for not allowing the disk directory feature to work on anything other than D1:?)

**Hometerm.**

I'm happy (read: *thrilled*) to say that, not only will **Hometerm** be sold unprotected, but that it has just about every feature that a terminal program needs, including some that you won't appreciate until that occasion where you *need* them, and other programs fall short. This may get me into trouble, but *there are so many features built into* **Hometerm** *that it's impossible to document them all without making the instructions as thick as the Yellow Pages; they are there, nonetheless*. I've promised not to divulge them now, but, somehow, these things tend to pop up on SIG*ATARI all the time. . .(Did I hear anyone say something about using this program with a joystick?)

No review could be complete without listing the main features, so here are *some* of them: (1) written in Action! for machine language speed, but does *not* require the Action! cartridge; (2) 300/1200 baud operation; (3) ASCII and ATASCII translation modes *and* a special Vidtex mode that supports some of the CompuServe fancy cursor commands; (4) XModem uploading and downloading that features a much more complete implementation of the Christensen protocol (what this means to the user is that, not only will **Hometerm** be compatible with current versions of AModem and AMIS BBSs, but it includes the features necessary to work properly with CompuServe's

soon-to-be-available XModem file transfers. . .also solves some of the nagging problems in current versions of AModem, where some "shortcuts" were taken); (5) supports "dumb" uploading and downloading of files for capturing text.

A nagging problem with many terminal programs limited the size of a file transfer to whatever free RAM was left for the buffer. In both XModem and "dumb" uploading and downloading, **Hometerm** will accept virtually any file size, limited only by the device you are using. While some programs *claim* to do this, they have a bug that chokes at 255 disk sectors. Not **Hometerm**! In fact, while you are limited to whatever fits on your disk (single or double density, of course), I've had occasion to capture text files of over 250,000 bytes. By using the capture option and the P: as the device, even this worked! Very, very rarely will this ever be needed, but this is what I mean by a feature that's invaluable when the need for it arises.

### Mini-DOS.

Lots of terminal programs have a mini-DOS feature that allows you to lock, unlock, rename or delete files. So does **Hometerm**. How many terminal programs have you seen that will copy a file between valid devices? Some cheat by telling you to *Load a file for UPLOAD*, then *redirect it by changing the device name and dumping the buffer.* This is okay, but limited by buffer size. **Hometerm** allows you to copy between supported devices of any size files, just like uploading and downloading.

### Real world situations.

**Hometerm** works great on BBSs, but many of you may find your Atari sometimes limited by the commercial networks you access. CompuServe and Dow Jones are terrific, but cost big bucks. This is really aggravating when you're in the process of uploading a large file, and the system "chokes" because so many others are on-line—and it can't support full 300 or 1200 baud transmissions. **Hometerm** helps you keep track of your on-line time with a resettable timer (which can also be configured like a clock, if you prefer). This is *always* visible on the status lines, which are visible both in terminal mode and when you are looking at the command menus. It helps with the uploading speed problem by allowing you to set a delay rate which will slow down your transmissions. *Another godsend!*

### *Macros,* you ask?

Not only does **Hometerm** have ten user-definable macros, which can be loaded in automatically at boot-up, but it permits you to have as many sets of macros on your disk as you wish—which you can change


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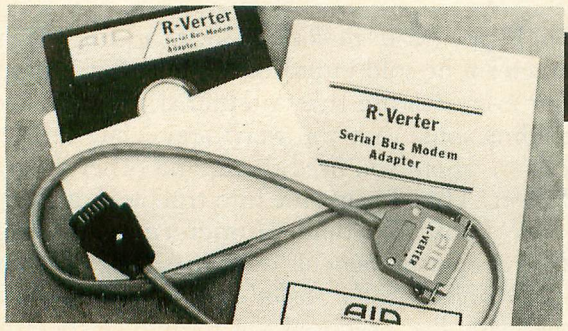


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while on-line! Sure, others may do this, but Russ went a step or two further.

The macro commands are "smart" macros. This means that they will send characters, then pause and wait for a reply from the host, then continue sending. Although the macro commands can be up to seventy characters long (more than I've *ever* used), they can be "chained."

One use for this would be where you have a single PPN and password for CompuServe, but frequently use different phone number to call. You can, for example, put different phone numbers in macros 1, 2 and 3—then put the login information for entering your PPN and password 1 time in macro 4. Whichever phone number you use (1, 2 or 3) can automatically "chain" to macro 4 and continue. This is just one example, and the possibilities are endless. Other advanced features allow you to include delay rates or open and close the capture buffer automatically, all in the smart macros.

I want to stress to novices, who might be feeling intimidated by the above, that you can totally ignore the intricacies of many of these features. If you don't want to use macros, they are not absolutely needed. The program as sold has built-in defaults for *everything*. They allow you to boot this program right out of the package and be on-line in minutes. If you can figure out how to turn on your Atari and type on the keyboard, **Hometerm** can do the rest.

However, where all the other "user-friendly" programs are soon outgrown by their users, this one keeps up every step of the way. If you need more features than this program provides, you probably need a mainframe computer, too.

Before wrapping up this report, which is already verbose but hasn't *touched* on many of the features of **Hometerm**, there are two that I must mention—as they're among the most requested features we've heard through SIG.

WORD WRAP — Some folks don't like it when the text they're reading isn't formatted to match the screen size limitations of the Atari. When 80-column text is read on a 40-column screen, invariably words are broken in the middle and continue on the next line. **Hometerm** allows you to "toggle" a word wrap feature on and off. This will take incoming text and reformat it on the screen, to avoid splitting words in the middle.

TEXT WINDOW — If you select the chat feature on some BBSs to "talk" to the Sysop, it's a two-person "conversation" and not too hard to do. One of the most popular features of SIG is the conference mode, which allows many people to chat in real time. When a dozen folks try this, the words are flying so fast that your typing is almost impossible to see before you send the line. Another limitation of all ASCII systems (CompuServe, ASCII BBSs, *Dow Jones*, etc.) is that you cannot use the four cursor keys (up, down, left and right arrows with CTRL). To solve both problems, **Hometerm** features a special three-line "text window" that allows you to type in your text. It won't be transmitted until you hit RETURN. This allows you to use the cursor control keys and lets you see your line before sending it. Again, this is "toggle-able" and can be invaluable.

Even now, I haven't talked about all the features (set screen margins, color; modify character set; or all the rest). My praise for this program is unprecedented. . .and I've tried to be objective. (Russ, you see, is an alternate Sysop of SIG; the package is being marketed by the firm of another Sysop, Michael Reichmann. Should anyone wonder, I'm acting as a beta tester and get the customary free copy, but am not otherwise affiliated with the package.)

**Hometerm** is *definitely* worth the price you'll pay; the entire **Homepak** series will be sold at the incredible price $49.95. Since **Hometerm** alone will pay for the series in a few short sessions, I think the package should be a part of *every* Atari owner's library. Thanks, Russ Wetmore (whether you're one person or a front for some programming wizards). This Sysop thinks, "Someone finally did it right." □


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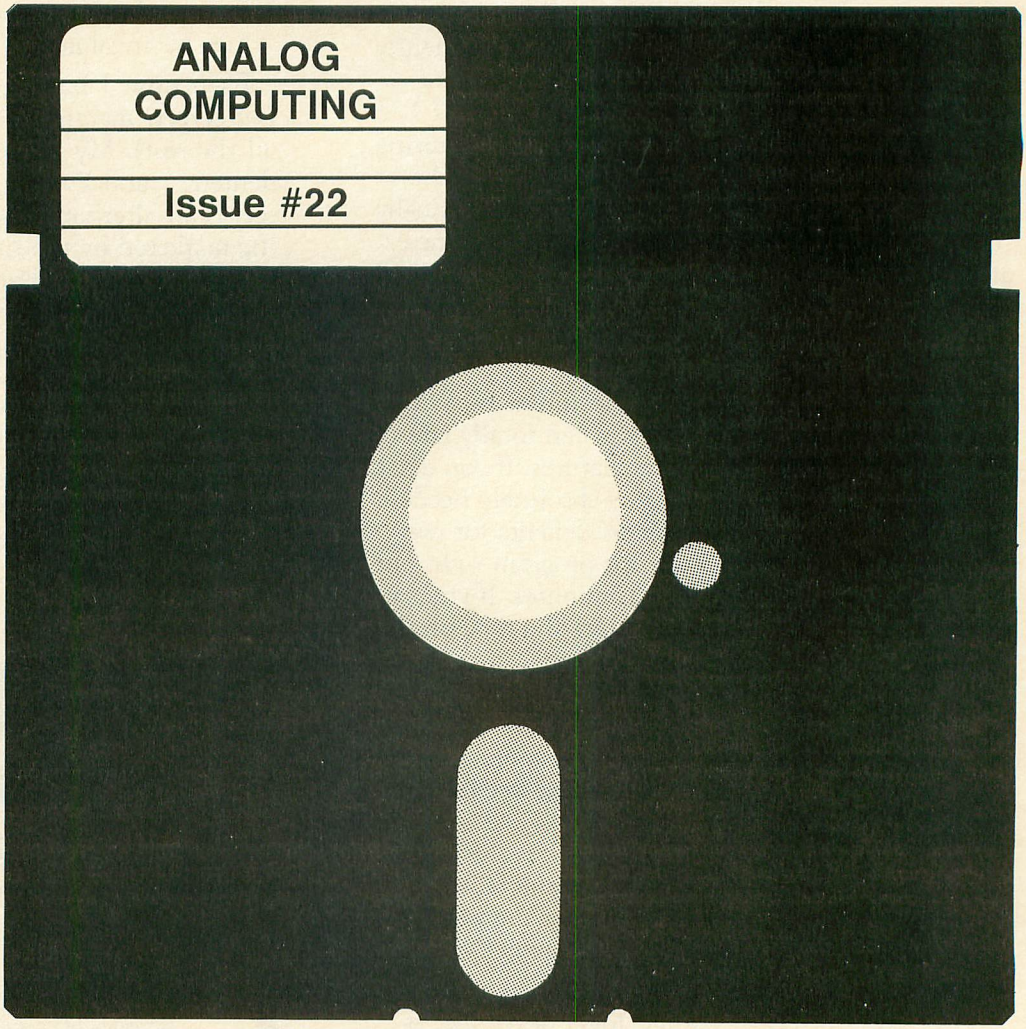

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CIRCLE #116 ON READER SERVICE CARD

# Griffin's Lair
## Educational Programs Review

by Braden Griffin, M.D.

**MUSIC CONSTRUCTION SET**
**by Will Harvey**
**ELECTRONIC ARTS**
**2755 Campus Drive**
**San Mateo, CA 94403**

What would Christmas be without music? What would life be without music? What would MTV be without music? *(A series of silent, disconnected images, with little intrinsic meaning. . .but it* would *make Twisted Sister less offensive. —Ed.)* So, for those tunesmiths among you, a one. . .and a two. . .and a. . .

The incredible music capabilities of the Atari were well known, at least to Atari buffs. There have been a number of programs developed to help one utilize these features and explore the world of music composition. Atari's own **Music Composer** was reviewed by the venerable Michael DesChenes back in the early days of **ANALOG Computing** (issue 1), when the magazine was printed on papyrus and scribed by a handful of strange, but dedicated monks. (I think that was back in the mid-fifties, just about the same time "The David Letterman Show" was getting started.)

Most of these programs required either some musical background or the investment of a lot of time, or both, just to get into the basics. I always found myself bouncing back and forth between the display screen and the instruction manual. . .a feat made even more difficult by the acquisition of bifocals. Thanks, Ben!

As I opened the **Music Construction Set**, I was apprehensive, yet eager. I'm not a total musical klutz, but my skills have no doubt atrophied waiting for the never-to-be-uttered request for my rendition of *So Rare* on the trombone. I wasn't looking forward to another tedious, time-consuming program explaining music composition, while I was just trying to figure out how to put a note on the screen.

On the other hand, the reputation of Electronic Arts, with its string of high quality products, eased this anxiety. My son started using Bill Budge's **Pinball Construction Set** the day he received it, adroitly creating games within a few hours. I noticed on the **Music Construction Set** (**MCS** from here on) package the same cute little scissors and hand symbols used in the pinball game creator, as well as a similarity of names. (Hey, I'm *not* just another pretty face.) I was hopeful that it would be as easy to master. Well, the reputation of Electronic Arts is still intact, and the **MCS** is easy enough for a father to use.

The simplicity of **MCS** is exemplified in its screen display, a reproduction of which (hopefully) accompanies this review. The upper half of the screen is occupied by two musical staves, each staff divided into measures. This is where the action takes place. . .

where the music is written. . .where the soul of music springs forth. . . it is *The Heart of Rock and Roll!* Whew. Sorry about that. A little flashback to the sixties.

The nine icons in the lower right corner control the essential functions. Those of you familiar with **Pinball Construction Set** will have no difficulty using the recognizable screen tools. It will take everyone else about thirty seconds to acquire these same skills. It's that simple.

The arrow symbols move the staves in their respective directions. Turning on the function of the HOME icon by pointing to it with the HAND and hitting the joystick's fire button—or the RETURN key—returns one to the beginning of the piece.

The PLUG icon offers the option of using a **KoalaPad** or an Atari **Touch Tablet** instead of a joystick. For those of you who don't own such accessories, although they may be useful adjuncts with many other programs, don't worry—the joystick is much easier to use in this case. Those of you without a joystick—boy, are you stuffy!

To play music, whether from the library of selections on the **MCS** disk, or from one's personal file of original compositions, the PIANO icon is turned on and *voila!*. . . musical magic. The DISK icon allows one to access the music files on a disk or to save more than twenty other masterpieces on another disk. Blank disks can be formatted while using the program, without losing the music just created. This is a welcome feature for those of us with oatmeal for brains.

The remaining three icons are the real workhorses of the program. The HAND picks up notes, rests, etc., carrying them to and setting them down in the desired location. The SCISSORS will cut a selected number of measures from the staff and store them in the buffer. The PASTE POT can then place this portion of music anywhere one wants.

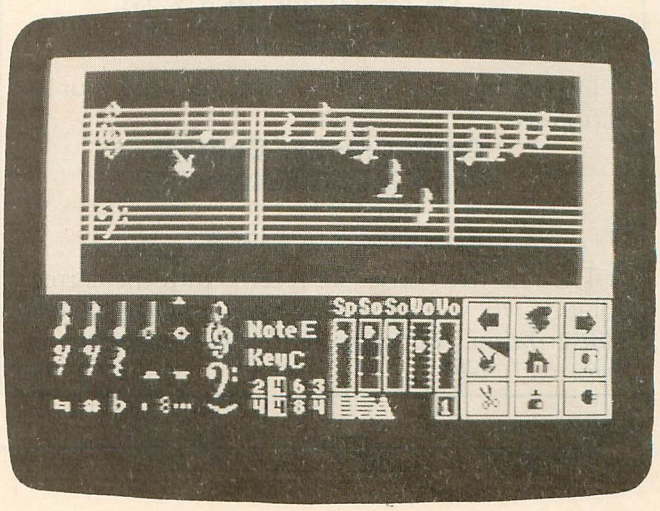
Using these techniques, repetitive musical phrases can be duplicated throughout a composition without having to construct them each and every time. Parts of one song can be appended to another, or even arranged to play simultaneously.

A number of other features extend the range of this program yet further. The speed at which a piece is played can be changed. This is quite useful when analyzing the effect of tempo with different compositions. The volume of each staff is controlled separately, giving one the opportunity to appreciate each section's contribution to the overall musical impression.

Although the usual method of musical composition uses both the treble and the bass clefs, one can write music using two staves in treble clef, or two in the bass clef only. The entire musical composition can be re-orchestrated using the sound controls for each staff.

Any of thirteen different instrumental sounds are available for use. These sounds include: harpsichord, organ, flute, echo, *vibrato*, slur(?) and drums—just to name a few. One may select the time signature from 2/4, 3/4, 4/4 or 6/8 time.

There is even the ability to transpose a piece of music into another key with the flick of a switch (or button, in this case). This is a very helpful feature for the more serious musical student. Another real bonus is the ability to print copies of one's creations. The requirements include an Atari 850 Interface Module and a parallel printer with graphics capability. Would it not be a trip to give a friend the sheet music to one's very own musical creation? Talk about "I write the songs. . ." Here it is!




**Music Construction Set.**

A particularly nice feature of the **MCS** is found in its ability to keep one from erring. A helpful beep sounds if one tries to do the impossible, like cut too much music into the buffer, or place one note on top of another. The facility to protect against the loss of a musical composition (hours of work) because of a misplaced finger is what I call user-friendly. Several other keyboard shortcuts are present, making the use of **MCS** quicker and easier as experience is gained.

The main disk contains a library of musical selections for a variety of uses. One can watch and listen as a fast-paced version of Rimsky-Korsakov's *Flight of the Bumblebee* scrolls by. Better yet, one may borrow a measure or two for use in one's own song.

Several different examples of bass line rhythms are found in one selection, and can be used as accompaniment. There is also a musical mystery game included on the disk. It challenges one to guess the name of a familiar melody which has been reduced to its rhythmic core. A group of ten such melodies are presented, with all the notes in the right order; they just sound the same tone.

The **MCS** is so simple to use that one might suspect the musical knowledge acquired of being artificial—not unlike playing by the numbers. Nothing could be further from the truth. As a note is selected

# CONTEST!

Here's a little contest that should keep all the code-crackers out there occupied.

The numbers below, when decoded, are a message in standard Atari ASCII. The numbers are in the proper sequence, and have been encrypted using a simple algorithm.

```
145 211 145 185 255 186 112 88
183 174 224 34 145 126 226 178
51 207 191 129 188 234 4 191
199 175 178 243 197 16 118 43
210 198 166 241 237 194 211 94
213 171 252 246 233 178 12 218
210 203 172 129 133 219 23 186
206 170 203 141 126 246 117 203
190 250 212 206 22 160 197 161
182 183 246 20 53 141
```

Decode the message, if you can, and send your solution to:

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The first five entries we receive with the correct solution will win a ***free one-year cassette or disk subscription.*** All entries must be postmarked before January 1, 1985.

and placed on the staff, it can be sounded and its name noted in the indicator. This may be the fastest and easiest way for anyone to learn musical notes.

From learning how many beats to put into a measure, to creating chords, or writing in a minor key, the scope of this program is amazing. The excellent manual—which progresses through the basics necessary for music composition in an entertaining and straightforward manner—is complemented by a handy reference card, containing all of the control features.

Anyone the least bit interested in taking full advantage of the Atari's music capabilities should look seriously at this program. It is great. I should warn you, though: the **MCS** could be responsible for consuming countless hours better spent elsewhere. . . say, writing one's column for **ANALOG Computing**.

It is worth noting that the **Music Construction Set** was created by Will Harvey. Not simply because he has two first names (unlike Hodding Carter, who has two last names), nor because his name asks a question. Nay, nay, you clever word magician. This superb program, from its unique design to its masterful approach to imparting musical knowledge, comes from the mind of a sixteen-year-old Eagle Scout, 4.0 student, president of the student body and high school football player. I am awed. □


# *New. . . Improved*
# 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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**THE XL BOSS**
**ALLEN MACROWARE**
**P.O. Box 2205**
**Redondo Beach, CA 90278**
**800XL $79.95 1200XL $89.95**

by Matthew J.W. Ratcliff

The **XL BOSS** (hereafter called "the **BOSS**") is a replacement for the Operating System ROM (Read Only Memory), which is designed to put you in control of your 800XL or 1200XL computer. This microcircuit converts your XL to a Revision B Operating System (OS) compatible machine.

This OS is found in Atari 400/800 machines less than three years old. It was, quite frankly, bug free. In the two and a half years I used my old Atari 400, I never found a bug of any sort. But, as many of you know, the XL OS has caused a lot of problems in software incompatibilities.

Many "illegal" operating system routine entry points for the Revision B OS have been documented in publications since Atari computers first hit the market. Software vendors quickly picked up on these, using them in programs sold to the Atari community. Now such software as **Text Wizard**, LJK's **Letter Perfect** (before revision 6.0), **Megafont**, **Synassembler** and many others can run with the **BOSS**.

There is a great deal of excellent public domain software which also required the **Translator**, until now. The **BOSS** even takes care of "compiled" BASIC programs (those compilers seem to break *all* the rules).

### The Translator vs. the BOSS.

Using the **Translator** disk, you can run these programs on a 1200XL or 800XL. There is one major drawback with this converter program: it does not recover from SYSTEM RESET properly. Pressing RESET with the **Translator** installed almost always results in a system coldstart or computer lockup. When running game programs, this is usually no big deal. However, in applications software such as assemblers and word processors, an inadvertent RESET can wipe out hours of work.

### Custom console key functions.

Not only does the **BOSS** recover properly from RESET, but it gives you some powerful options. Press and hold the OPTION key at power-up to enable XL BASIC (800XL only). This is just the opposite of the XL OS. If a cartridge is installed at power-up, it will automatically be given control of the system. By pressing the SELECT key during power-up, you enable the RAM OS. SELECT and OPTION enable the RAM OS and XL BASIC. This gives you the 4K of free RAM from $C000 to $CFFF. This RAM OS won't crash as the **Translator** does when SYSTEM RESET is pressed.

The **BOSS** also protects any software you may have stashed in the extra 4K. If you have an application program assembled to this address, it can be loaded from an AUTORUN.SYS file when the computer is powered up, while pressing SELECT. Since you probably don't have any applications software for this extra RAM, Allen Macroware provides **Macromon**, a powerful machine language monitor. Its functions will be outlined below.

Another unique feature of the **BOSS** is that it allows you to coldstart the system without turning off the power. This can be done by pressing and holding START, then pressing RESET. You will hear a beep, as if you were going to load a tape. Press RETURN to boot a tape or press RESET again to perform the system coldstart (hitting OPTION and/or SELECT, as desired).

This feature will keep **Macromon**—or whatever program you may have in this extra 4K—intact. If you've booted up in the ROM OS and decide you need **Macromon**, just press RESET while holding SELECT. You will be in the RAM OS and may execute a binary load from DOS or **MacroDOS** (see below).

If **Macromon** is already installed (or any program with entry point $C000), press and hold OPTION and SELECT, then hit RESET. This warmstart will send control to the program beginning at $C000, yet keep all your lower RAM program space intact.

The "console key" coldstart is not only handy, it's easy on the microcircuits. The chips in your computer are subjected to an inevitable power surge when the machine is turned on. If a computer is going to die, it will almost always happen when power is first applied. The custom coldstart feature minimizes this effect when you wish to reboot the system with a new DOS or application program. In a nutshell, the **BOSS** is a hacker's dream!

### Why buy?

If you aren't the hacking type, this is still a valuable XL enhancement. Aside from fixing incompatibilities in software, it gives you additional buffer space when using disk-based applications software where every byte counts (**Letter Perfect**, **Text Wizard**, **VisiCalc** and others).

Using cartridge-based software, however, this is not the case. Cartridge software does not look for RAM above its own address space. The **BOSS** can be used in many other ways from BASIC and assembler/editor cartridges. I think the 4K extra RAM alone is worth the price of the **BOSS**.

### Free software.

Allen Macroware provides **Macromon** and **MacroDOS** on disk with your purchase of the **BOSS**. **Macromon** is a machine language monitor that loads into the RAM-based system above the cartridge space. Its commands are as follows:

**d** — Display memory.

**g** — GOTO address. No return (RTS) is expected.

**j** — Jump to address, with return expected (RTS—control returned to **Macromon**).

**s** — Split the screen, displaying two different sections of memory at the same time.

**p** — Print the screen on your printer.

**.** — Convert decimal number to hexadecimal.

**$** — Convert hexadecimal number to decimal.

**f** — Find string of data in memory.

**c** — Change bytes of memory.

**v** — Verify memory; compare sections of the memory and display differences in the split screen mode above.

**m** — Move a block of memory.

**r** — Read specified disk sectors into memory (single and double density supported).

**w** — Write memory to disk.

With **Macromon**, you can customize your RAM-based OS before running your application software. The manual documents such modifications as converting the CTRL-ARROW keys to the normal key operation. The math symbols can then be accessed from the SHIFT key, and the formerly-shifted characters are retrieved with the CTRL key.

**MacroDOS**, written by Jerry Allen, comes with your **BOSS**, as well. This mini DOS remains resident in RAM at all times. You can freely switch from your cartridge to **MacroDOS** and back. . .without affecting the program in memory.

**MacroDOS** was published in *Compute!*, in the June and July 1984 issues. It supports all DOS functions except: write DOS files and file/disk copy. It's quite handy, as is **Macromon**. I only wish that **Macromon** would display memory with disassembly.

### Installation.

The manual is accurate and provides helpful drawings to guide you in disassembling your XL computer and replacing the OS ROM. It starts with several cautions. First, you are advised not to attempt this revision until after your computer is out of warranty (in ninety days). Such a modification will void it.

Second, if you aren't the do-it-yourself type, you should seek the assistance of a knowledgeable friend or an Atari service center. If you're handy with your screwdriver and *patiently* follow the instructions, you shouldn't have any problems. It will take a bit more than the advertised ten minutes to install. . .I read the instructions twice before starting, and it still took me half an hour, from start to finish (and I'm an electrical engineer).

The point is: proceed with great care and attention to detail. You only want to do this once. I have one *caveat* for you at this point. In the 800XL instructions, you are advised to "pry the side of the case outward" to lift out the joystick port connectors.

I found that absolutely no prying is necessary—and should *not* be done, or you risk breaking the case. When you've removed all the screws that hold the mother board in place, gently lift up the left front corner. As you bring the PC board forward and to the left, all the connectors and switches at the rear should pull free. At this point, continuing to pull forward and to the left will free the joystick connectors with no prying at all.

### Does the BOSS pay?

I had no trouble following the directions, and the **BOSS** worked perfectly for me on the first try. I've already written handy machine language utilities to stash away in that "completely safe" RAM above the cartridge space. I used to do this with the **Translator**, but the time-consuming double boot procedure and fragile RAM-based OS were not worth the trouble.

In the past three weeks of using the **BOSS**, I have yet to lock up my machine (an hourly occurrence with the **Translator**). The **BOSS** is permanent relief from the **Translator** blues. . .I highly recommend it. □

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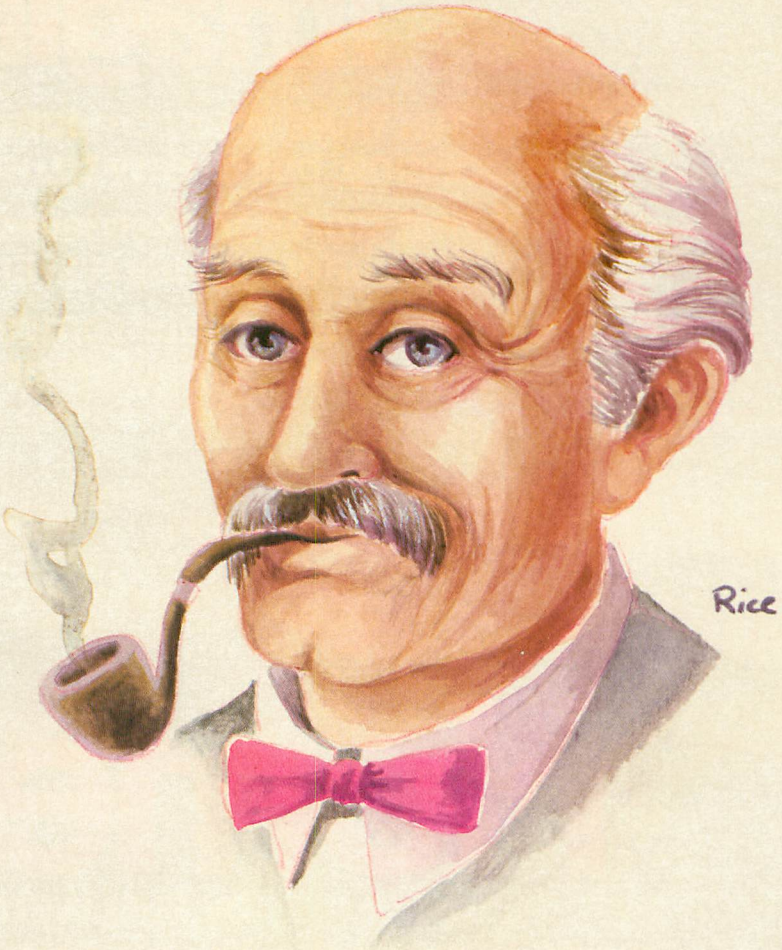
# Ask Mr. Forth




by Donald Forbes

Few things in life are harder than hitting a round ball with a curved bat. Baseball coaches who do their homework can make it seem easy. Some young folks get the knack. Some few grow up to be experts. Then they make more money in a year than the President of the United States. Dave Winfield of the New York Yankees earned more than $2 million last year.

If you want to demonstrate FORTH, remember the coach: you have to make it *look* easy. One way is to present FORTH as a language, even though it's more than that. It is also an operating system and can be a complete software interface between the hacker and his hardware. But FORTH can be thought of as a language for program development.

**The grammar of FORTH.**

If FORTH is a language, it must has words. And every language has to have words which *do* things (called "verbs") and words which *name* things (called "nouns"). What are the verbs in FORTH? What are the nouns? And which should we tackle first?

If we are to demo FORTH to our friends, we should present the nouns first, because that makes it easy for them to start writing simple programs. Before we do that, though, let's show them what the verbs look like. How? All it takes is one word: *VLIST.*

On your screen you'll get a listing of all the words in the FORTH dictionary. You can pause the listing with CTRL 1. These are all the words you will need to know to master FORTH. Most of them are written in FORTH, except for a few at the bottom of the list, which are written in assembly language. The majority are verbs, because in FORTH a "word" is used to refer to a command, instruction or executable procedure.

When you talk about the dictionary in FORTH, you're usually referring to the FORTH vocabulary. But there are other vocabularies as well—particularly the editor and assembler vocabularies.

To see them, you first have to load the editor or assembler code. Then type *EDITOR DEFINITIONS* followed by *VLIST.* Typing *FORTH DEFINITIONS* will restore the original VLIST.

If you scan the output from VLIST, you will immediately recognize a few of the verbs of FORTH. There is the plus sign (+) for addition, the minus sign (−) for subtraction, the asterisk (*) for multiplication and the slash (/) for division. (What the Mock Turtle in *Alice in Wonderland* called "the different branches of Arithmetic—Ambition, Distraction, Uglification, and Derision." And, of course, VLIST.)

Where are the nouns? The answer is: you create them yourself. What are they? They can be numbers, letters or strings of characters. How do you create them? Where do you put them? That brings us to the topics of your demo for today.

**Your queue (or stacking the deck).**

People have been standing in line for aeons, so mathematicians developed what they call the queueing theory, which they describe as the area of stochastic (random) processes, emphasizing those processes modeled on the situation of individuals lining up for service.

The theory studies two kinds of queues: a queue like a line at the box office, called a "first-in, first-out" or "FIFO" queue; and a "last-in, first-out" or "LIFO" queue, usually called a "stack." Some common stacks we all recognize are: a card deck with the top card turned over, the row of shopping carts in the grocery store, Tom Hudson's descriptive stack of pancakes (**Boot Camp**, issue 20), or the balls in a can of tennis balls. The last ball in the can is at the top-of-stack (or "TOS"), and there is no way in the world (without breaking the can) to get at the bottom ball without removing each of the others in turn.

A stack is easier to manage than a queue. You only need a pointer to keep track of the top of the stack and a counter to record the depth.

What does a stack have to do with FORTH? Actually, everything. FORTH is built around the dictionary (and editor) for verbs and the stack for nouns. (The other key elements of FORTH are the return stack, the text and inner interpreters, the assembler and disk memory—all good topics for future demos.)

Whenever you create a noun in FORTH, it goes on the top of the stack and stays there until you retrieve it. Mastery of the stack is the key to mastery of FORTH. Some words in FORTH do not affect the stack, but most of them either take or remove data from the stack. A few of them do both.

The stack (also known as the "data stack" or "parameter stack") is the main reason for FORTH's power and flexibility. As you create new procedures, you can pass data backward and forward by means of the stack. There are no parentheses in FORTH (except to enclose your comments), and the stack is what makes it possible to get rid of the parentheses.

There is a list processing language called LISP that offers some competition to FORTH in the field of AI (artificial intelligence). It has no stack and, consequently, uses so many parentheses that some jokers will tell you that LISP stands for Lots of Irritating Silly Parentheses.

**Using stacks.**

You have to get used to the FORTH stack. Not because it's difficult to use, but because of the way you were brainwashed in elementary school. You were told that 2 plus 3 makes 5. What the teacher should have said is: "Take 2, then take 3, and add them together."

If you type:

```
2 3 + .
```

FORTH will put the *2* on the stack, then the *3*. The "word" *+* takes the two top items from your stack, adds them together and puts the answer *on the top* of the stack. The final . (dot) takes the number off the top of the stack and prints it.

If you want to calculate (3+4)*(5+6), you will say to yourself: "Take *3* and *4* and add them, then take *5* and *6* and add them, then multiply the answers." FORTH does it exactly the same way:

```
3 4 + 5 6 + * .
```

and comes back with *77 OK*.

Here is what the stack looks like if you calculate (4+7)*(9−3) and enter it in FORTH notation:

```
                3
    7       9   9   6
4   4  11  11  11  11  66
-----------------------
4   7   +   9   3   -   *   . 66 OK
```

Fortunately, the stack can be displayed with ease at any time by the .S word, which is found in **QS Forth**, **Team Atari Forth** and **valFORTH**. In **Team Atari Forth**, the command *STACKON* will display the stack at the top of the screen in color. In **valFORTH**, the command *ON STACK* displays the stack after each OK.

With the stack and some simple arithmetic commands, you can use your FORTH computer as a handheld calculator.

```
22 33 + 44 + . 99 OK
55 22 - . 33 OK
12 144 * . 1728 OK
1728 12 / . 144 OK
1730 12 /MOD . . 144 2 OK
```

You can even demonstrate exponentiation with this code:

```
: ** 1 - -DUP IF OVER ROT ROT 0 DO
  OVER * LOOP SWAP DROP THEN ;
```

so that you get:

```
2 14 ** . 16384 OK
```

if you want to multiply two by itself fourteen times.

You can also use your FORTH computer as a programmable calculator. For example, to evaluate the polynomial $5x^2-7x-10$, you could use this code:

```
: POLY1 DUP DUP * 5 * SWAP
  7 * - 10 - . ;
```

which would give you:

```
75 POLY1 27590 OK
90 POLY1 -25676 OK
```

Or, if you wanted the value of this expression for various values of y ($2y^4+3y^3+4y^2+5y+6$), then this code will work:

```
: SQUARED DUP * ;
: CUBED DUP SQUARE * ;
: 4THPOWER DUP CUBED * ;
: POLY2 DUP DUP DUP 4THPOWER 2 *
  SWAP CUBED 3 * + SWAP SQUARED
  4 * + SWAP 5 * + 6 + . ;
```

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so that, for a value of two, we get:

```
2 POLY2  88 OK
```

Four factorial is four times three times two times one. Here is a factorial program:

```
: FACTORIAL 1 + 1 1 ROT ROT
  DO I * LOOP ;
```

which will give us:

```
7 FACTORIAL 5040 OK
```

and here is another program to find the square root of an unsigned number:

```
: PICK 2 * SP@ + @ ;
: SQUAREROOT 1 BEGIN OVER 0 3 PICK
  U/ SWAP DROP OVER + 0 2 U/
  SWAP DROP SWAP OVER =
  UNTIL SWAP DROP ;
```

which we can test with:

```
32400 SQUAREROOT 180 OK
```

To work with the stack, as you have seen, we must bear in mind the tennis balls in a can. We need verbs in FORTH that will let us add, change or delete data from the stack.

Deleting is easy. DROP removes the top item from the stack this way:

```
2 3 4 5 DROP DROP . . 3 2 OK
```

A quick way to wipe the stack clean is to type an imaginary word (like XX), which gives an error message and, at the same time, clears the stack.

To add items to the stack, we can use DUP, −DUP, OVER and PICK—like this:

```
3 4 DUP DUP . . . . 4 4 4 3 OK
0 -DUP ( dupe if nonzero ) . 0 OK
2 3 OVER . . . 2 3 2 OK
4 5 2 PICK . . . 4 5 4 OK
```

To move items on the stack, we use SWAP, ROT and ROLL.

ROLL, like PICK, is not in fig-FORTH but can be defined as follows:

```
: ROLL DUP 1 = IF DROP ELSE DUP 1
  DO SWAP R> R> ROT >R >R >R LOOP
  1 DO R> R> R> ROT ROT >R >R
  SWAP LOOP ENDIF ;
```

Here are some examples that only move the items on the stack:

```
2 3 4 SWAP . . . 3 4 2 OK
4 5 6 ROT . . . 4 6 5 OK
7 8 9 3 ROLL . . . 7 9 8 OK
```

You must be aware during your demo that the stack will only handle 16 bits at a time. With this number of bits, we can only represent integer numbers from −32768 to +32767. One of the bits is used for the plus or minus sign. The above examples will give you wrong answers if you work with numbers outside this range. If we do not need the sign bit, then we can handle unsigned values from 0 to 65,535.

If you need larger numbers than this, you can work with the two top items on the stack, which will give you 32 bits. These can represent signed numbers between −2,147,483,648 and +2,147,483,647 (or from 0 to 4,294,967,295, if unsigned). To do this, however, you will need a different set of FORTH words. There are floating point packages which allow you to handle numbers with the same ease as in BASIC. They are not part of the public domain fig-FORTH, but exist in vendor offerings such as **valFORTH**.

One point that is often overlooked in FORTH is brought out by C. Kevin McCabe in his book *FORTH Fundamentals, Vol. I* ($16 from Mountain View Press, P.O. Box 4656, Mountain View, CA). He gives the most complete explanation to date of the basics of fig-FORTH. On page 39, he says:

> How does FORTH distinguish between signed and unsigned characters on the stack or in memory? Quite simply, it doesn't. The characteristics of each value exist only in the programmer's mind, in selecting operations where the value is an appropriate operand. FORTH does not keep track of the kind of values represented, nor does it prevent or check for range errors. The burden is on you, the programmer, to insure that the contents of the stack and memory are those intended and that they represent values of the correct type.

In other words, the 16 binary digits at the top of the stack mean whatever you say you want them to.

This raises another point. You can display numbers on the stack in binary, octal, decimal or hexadecimal. In fig-FORTH, in fact, you can choose any base between 2 and 36. For example:

```
HEX 100 DECIMAL . 256 OK
HEX 10 DECIMAL . 16 OK
```

However, as McCabe points out: "It must be emphasized that the numeric base is only used during the conversion of values sent to and from the terminal. Internally, all values will still be in binary. . ."

The number on the stack can also represent an address. If you type:

```
0 1000 TYPE
```

then FORTH will interpret the 0 as an address and start to type out the character equivalent of the first 1000 bytes in memory.

The number on the stack can also be used to represent a logical flag, as with this code:

```
: TRUEORFALSE IF ." True" ELSE
  ." False" ENDIF ;
```

so that can make a test for false if zero and true otherwise:

```
20 TRUEORFALSE True OK
0  TRUEORFALSE False OK
-2 TRUEORFALSE True OK
```

We can also use the stack to store the ATASCII code of keyboard characters, with this code:

```
: ATASCII KEY CR DUP EMIT SPACE . ;
```

which will wait for a key press and then print the code, as well as the corresponding character:

```
ATASCII ( type a Z )
Z 90 OK
```

The stack can also be used to handle bytes—equivalent to 8 of the 16 bits on the stack. The words C! and C@ store and fetch 1 byte at a time to and from memory; they merely pad the other 8 bits with zeros. The assembler command C moves bytes from the stack to the dictionary.

At this point, your audience should begin to appreciate the two principal features of FORTH. First, you write programs by expanding the dictionary (hence, the language) with your own verbs. Second, FORTH can use a stack (instead of named variables, as other languages do) to pass your nouns—or data—from one word (or subprogram) to another. If FORTH code appears less readable than the code in other languages, this is a small price to pay for ease in developing fast and efficient programs.

The power and flexibility of the stack brings with it the responsibility—that falls on you—to insure that everything is done correctly. Much of the effort of learning FORTH consists of memorizing the stack input and output parameters of the respective FORTH words.

In the code below, you will notice that PLOT and DRAWTO and POS. all expect two numbers on the stack, while SOUND looks for four.

What we have here is a small "wake up" demo to start your presentation. Remember that any character (except BACKSPACE, BLANK and the RETURN key) can be used as a FORTH word. Some tricks were used to save space, such as the use of the caret (^), vertical stroke (|) and underscore (_), as well as lower case letters and, finally, the redefinition of PLOT as PL and DRAWTO as DR.

Note, also, the rising sound on each letter—it will help to identify the double consonants. The demo will work on both **Team Atari Forth** and **valFORTH** versions of fig-FORTH, so you can modify it to suit your tastes. **QS Forth** requires a minor change to screen 1. The number in the COLOR statement must be added to each PLOT or DRAWTO, so remove *3 COLOR* in Line 4 and change Line 6 to: *:PL 3 PLOT;:DR 3 DRAWTO;*

There are two other "last-in, first-out" stacks in FORTH. They are the return stack and the dictionary itself. But, if you want to make FORTH look easy, you'll have to save those demonstrations for another day. □

```
SCR # 1
  0 ( analog stack 1 )
  1 DECIMAL 250 VARIABLE NOTE
  2 : ^ 30000 0 DO LOOP
  3   0 0 0 0 SOUND 2 GR. ;
  4 : | 2 GR. 3 COLOR NOTE @ 3 -
  5   NOTE ! 0 NOTE @ 10 8 SOUND ;
  6 : PL PLOT ;  : DR DRAWTO ;
  7 : a | 3 9 PL 9 0 DR 15 9 DR
  8   6 6 PL 12 6 DR ^ ;
  9 : d | 5 0 PL 5 9 DR 12 9 DR
 10   15 6 DR 15 3 DR 12 0 DR
 11   5 0 DR ^ ;
 12 : e | 13 0 PL 5 0 DR 5 3 DR 11
 13 4 PL 5 4 DR 5 9 DR 13 9 DR ^ ;
 14 : f | 13 0 PL 5 0 DR 5 3 DR
 15 11 4 PL 5 4 DR 5 9 DR ^ ; -->
```

```
SCR # 2
  0 ( analog stack 2 )
  1 : h | 5 0 PL 5 9 DR 13 0 PL
  2   13 9 DR 5 4 PL 13 4 DR ^ ;
  3 : i | 9 0 PL 9 9 DR ^ ;
  4 : k | 5 0 PL 5 9 DR 6 3 PL
  5   13 0 DR 6 4 PL 13 9 DR ^ ;
  6 : l | 5 0 PL 5 9 DR 13 9 DR ^ ;
  7 : n | 5 9 PL 5 0 DR 13 9 DR
  8   13 0 DR ^ ;
  9 : o | 5 0 PL 5 9 DR 13 9 DR
 10   13 0 DR 5 0 DR ^ ;
 11 : p | 5 9 PL 5 0 DR 13 0 DR
 12   13 4 DR 5 4 DR ^ ;
 13 : r | 5 9 PL 5 0 DR 13 0 DR
 14   13 4 DR 5 4 DR 13 9 DR ^ ;
 15                          -->
```

```
SCR # 3
  0 ( analog stack 3 )
  1 : s | 13 0 PL 5 0 DR 5 4 DR
  2   13 4 DR 13 9 DR 5 9 DR ^ ;
  3 : t | 5 0 PL 13 0 DR 9 0 PL
  4   9 9 DR ^ ;
  5 : u | 5 0 PL 5 9 DR 13 9 DR
  6   13 0 DR ^ ;
  7 : w | 5 0 PL 5 9 DR 9 6 DR
  8   13 9 DR 13 0 DR ^ ;
  9 : y | 5 0 PL 9 5 DR 9 9 DR
 10   9 5 PL 13 0 DR ^ ;
 11 : _ ^ ;
 12                          -->
 13
 14
 15
```

```
SCR # 4
  0 ( analog stack 4 )
  1 : MES52 p e o p l e _ w h o _
  2   t h i n k _ t h e y _ k n o w
  3   _ i t _ a l l _ a n n o y _
  4   t h o s e _ o f _ u s _ w h o
  5   _ r e a l l y _ d o ^ 0 GR. ;
  6 : MES53
  7 10  5 POS. ." PEOPLE WHO THINK"
  8 10 10 POS. ." THEY KNOW IT ALL"
  9 10 15 POS.
 10            ." ANNOY THOSE OF US"
 11 12 20 POS. ." WHO REALLY DO"
 12 20 23 POS. QUIT ;
 13
 14 : MESSAGEONE NOTE @ 250 NOTE !
 15   MES52 MES53 ;
```

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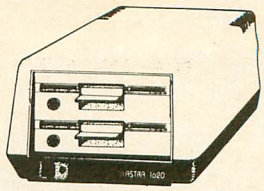

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# Weather Forecaster

16K Cassette or Disk

by Dr. Steven B. Newman

As we're all made painfully aware each day, weather forecasting is not yet an exact science. In fact, it sometimes seems that we could all do better than the so-called experts. **Weather Forecaster** gives you a chance to do your own forecasting. Then, if you find yourself shoveling 6 inches of "partly cloudy," you'll have no one to blame but yourself.

**The facts for forecasting.**

The scientific basis behind the **Weather Forecaster** lies in the way in which pressure changes and local winds are related to large scale atmospheric movements. Low pressure systems, which are associated with clouds and rainfall, are usually preceded by southerly or easterly winds and falling barometric pressure. A rising barometer accompanied by northerly or westerly winds is a good indication of approaching high pressure and improving weather.

All one needs, then, to make relatively accurate short-range weather forecasts is a knowledge of the present barometric tendency, pressure and wind direction. **Weather Forecaster** takes any particular combination of these factors and branches to a list of possible forecasts, each of which applies to a unique situation.

For example, a slowly falling barometer combined with southeasterly winds is usually a good indication of an approaching warm front. Warm fronts are often preceded at the surface by a large area of precipitation. Thus, the program will forecast *RAIN AND WARMER* in such a situation.

Or, after the passage of a cold front, the barometer may rise, with winds shifting to the northwest. Under such circumstances, the **Weather Forecaster** will predict *FAIR AND COLDER*.

**Using the forecaster.**

After you've loaded the program and typed *RUN*, the computer will prompt you for the barometric tendency, present barometric pressure and present wind direction. The forecast will then be displayed on a graphics 2 screen. I have chosen to give different forecasts in different colors—green for fair weather, blue for cold weather, orange for warm weather and red for inclement weather.

Try running the **Weather Forecaster** at the same time each day for about a month. Compare the accuracy of your forecasts with those produced by the National Weather Service—or any other source of weather information. I think you'll be pleasantly surprised with the results.

Don't get too cocky, though. You'll soon realize that weather forecasting can be an exhilarating, yet often humbling experience. □

BASIC listing.

```
1 DIM INST$(3):K6=6
2 GRAPHICS 2+16:? #K6:? #K6:? #K6:? #K
6;"      weather":? #K6:? #K6;"      f
orecast":? #K6:? #K6;"      program"
3 FOR I=1 TO 1500:NEXT I
4 GRAPHICS 2+16:? #K6:? #K6:? #K6:? #K
6:? #K6;"      BY"
5 ? #K6:? #K6;"DR. STEVEN B. NEWMAN":F
OR I=1 TO 1500:NEXT I
6 GRAPHICS 0:? :? :? :? "Do you want i
nstructions (Y/N)";
7 INPUT INST$:IF INST$(1,1)="Y" THEN 8
000
10 ? "K":? :? :? "What is the pressure
 tendency?":? :? :? "1) RISING":? " (u
p )0.05 inches in past 12 hours)"
20 ? :? "2) STEADY":? " ((0.05 inch ch
ange in past 12 hours)"
30 ? :? "3) FALLING SLOWLY":? " (0.05-
0.2 inch drop in past 12 hours)"
40 ? :? "4) FALLING RAPIDLY":? " (down
 )0.2 inches in past 12 hours)"
50 ? :? "Indicate by number":TRAP 50:I
NPUT TENDENCY
60 IF TENDENCY-INT(TENDENCY)<>0 THEN G
OTO 80
70 ON TENDENCY GOTO 1000,2000,3000,400
0
80 ? :? "ILLEGAL ENTRY--TRY AGAIN!":FO
R I=1 TO 500:NEXT I:GOTO 10
1000 REM Barometer Rising
1010 GOSUB 5000
1040 ON PRESSURE GOTO 1100,1200,1300
1100 ON WIND GOSUB 7010,7010,7020,7020
,7020,7020,7010,7010:GOTO 7500
1200 ON WIND GOSUB 7010,7020,7040,7050
,7020,7020,7010,7010:GOTO 7500
1300 ON WIND GOSUB 7010,7020,7010,7020
,7020,7020,7020,7060:GOTO 7500
2000 REM Barometer Steady
2010 GOSUB 5000
2040 ON PRESSURE GOTO 2100,2200,2100
2100 GOSUB 7170:GOTO 7500
2200 ON WIND GOSUB 7170,7170,7170,7170
,7170,7170,7020,7020:GOTO 7500
3000 REM Barometer Falling Slowly
3010 GOSUB 5000
3040 ON PRESSURE GOTO 3100,3200,3300
3100 ON WIND GOSUB 7120,7180,7110,7110
,7110,7190,7120,7120:GOTO 7500
3200 ON WIND GOSUB 7200,7110,7110,7210
,7210,7220,7050,7120:GOTO 7500
3300 ON WIND GOSUB 7200,7280,7290,7260
,7160,7050,7300,7300:GOTO 7500
3310 GOTO 7500
4000 REM Barometer Falling Rapidly
4010 GOSUB 5000
4040 ON PRESSURE GOTO 4100,4200,4300
4100 ON WIND GOSUB 7070,7070,7080,7090
,7100,7110,7110,7120:GOTO 7500
4200 ON WIND GOSUB 7130,7140,7140,7150
,7140,7130,7110,7160:GOTO 7500
4300 ON WIND GOSUB 7230,7240,7240,7250
,7110,7260,7160,7270:GOTO 7500
5000 REM Pressure Subroutine
5010 ? "K":? :? :?
5020 ? "What is the barometric pressur
e?":? :?
5030 ? "1) Below 30.00 inches":?
5040 ? "2) 30.00 to 30.20 inches":?
```

*(continued on next page)*


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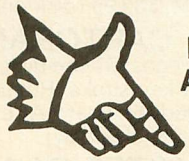

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CIRCLE #123 ON READER SERVICE CARD

*(continued from page 31)*

```
5050 ? "3) Above 30.20 inches":? :?
5060 ? "Indicate by number":TRAP 5060:
INPUT PRESSURE
5070 IF PRESSURE=1 OR PRESSURE=2 OR PR
ESSURE=3 THEN 5500
5080 ? :? "ILLEGAL ENTRY--TRY AGAIN!":
FOR I=1 TO 500:NEXT I:GOTO 5000
5500 REM Wind Direction Subroutine
5510 ? "{CLEAR}":? :? :?
5520 ? "What is the wind direction?":?
 :?
5530 ? "1) NORTH":? "2) NORTHEAST":? "
3) EAST":? "4) SOUTHEAST"
5540 ? "5) SOUTH":? "6) SOUTHWEST":? "
7) WEST":? "8) NORTHWEST":? :?
5550 ? "Indicate by number":TRAP 5550:
INPUT WIND
5560 IF WIND-INT(WIND)<>0 THEN 5600
5570 IF WIND>0 AND WIND<9 THEN 6000
5600 ? :? "ILLEGAL ENTRY--TRY AGAIN!":
FOR I=1 TO 500:NEXT I:GOTO 5500
6000 REM Graphics Set-up Subroutine
6010 GRAPHICS 2+16:? #K6:? #K6:? #K6;"
THE FORECAST":? #K6;"VALID 24 HOURS":?
 #K6;"FROM NOW IS:":? #K6:? #K6
6020 RETURN
7000 REM Forecast List
7010 ? #K6;"FAIR AND COOLER":RETURN
7020 ? #K6;"fair":RETURN
7030 ? #K6;"FAIR AND COLDER":RETURN
7040 ? #K6;"FAIR":? #K6;"COLDER IN WIN
TER":RETURN
```


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CIRCLE #124 ON READER SERVICE CARD


```
7050 ? #K6;"FAIR AND WARMER":RETURN
7060 ? #K6;"FAIR, MUCH COLDER":RETURN
7070 ? #K6;"severe gale,":? #K6;"heavy
 rain or snow,":? #K6;"in winter, COLD
 WAVE":RETURN
7080 ? #K6;"severe storm,":? #K6;"rain
 or snow":RETURN
7090 ? #K6;"severe storm":? #K6;"immin
ent":RETURN
7100 ? #K6;"storm,":? #K6;"IN WINTER,
 COLDER":RETURN
7110 ? #K6;"rain":RETURN
7120 ? #K6;"unsettled":RETURN
7130 ? #K6;"RAIN AND COLDER":RETURN
7140 ? #K6;"increasing wind,":? #K6;"r
ain":RETURN
7150 ? #K6;"increasing wind,":? #K6;"r
ain":? #K6;"WARMER":RETURN
7160 ? #K6;"INCREASING":? #K6;"CLOUDIN
ESS":RETURN
7170 ? #K6;"no change":RETURN
7180 ? #K6;"RAIN, COOLER":RETURN
7190 ? #K6;"unsettled, cloudy":RETURN
7200 ? #K6;"unsettled,":? #K6;"probabl
y cloudy":RETURN
7210 ? #K6;"RAIN AND WARMER":RETURN
7220 ? #K6;"unsettled, WARMER":RETURN
7230 ? #K6;"cloudy":? #K6;"rain probab
le":? #K6;"WARMER":RETURN
7240 ? #K6;"rain":? #K6;"increasing wi
nds":RETURN
7250 ? #K6;"cloudy and rain":RETURN
7260 ? #K6;"CLOUDY AND WARMER":RETURN
7270 ? #K6;"unsettled,":? #K6;"rain if
":? #K6;"winds continue":RETURN
7280 ? #K6;"SUMMER:LIGHT WINDS":? #K6;
"Winter: rain":RETURN
7290 ? #K6;"summer:unsettled":? #K6;"W
inter:rain":RETURN
7300 ? #K6;"RISING TEMPERATURES":? #K6
;"and fair":RETURN
7500 IF PEEK(53279)=6 THEN GOTO 10
7510 GOTO 7500
8000 REM Instructions
8010 ? "{CLEAR}":? "This program forecasts t
he weather":? "for the 24 hour period
beginning"
8020 ? "24 hours after forecast time."
8030 ? "User supplies the following da
ta:":? :? "     1) Pressure Tendency":
? :? "     2) Present Pressure"
8040 ? :? "     3) Present Wind Direct
ion":? :?
8050 ? "To begin, press START.  To re-
run":? "the program after completion,
press":? "START.  To stop the"
8060 ? "program at any time, press ":?
 "SYSTEM RESET."
8070 GOTO 7500
```

## CHECKSUM DATA.

*(see page 20)*

```
1 DATA 679,553,137,201,466,609,885,40,
562,676,663,967,965,813,57,8273
1000 DATA 542,925,369,504,520,515,532,
927,373,367,587,976,929,385,551,9002
3200 DATA 534,587,733,276,931,393,565,
558,590,448,281,551,73,767,389,7676
5060 DATA 993,466,743,456,296,689,83,9
01,226,266,298,763,354,772,791,8097
7000 DATA 49,516,588,499,402,683,340,4
99,120,971,487,606,628,518,410,7316
7150 DATA 275,472,491,385,985,760,701,
577,242,934,452,906,233,511,20,7944
7300 DATA 805,368,747,889,520,970,839,
15,17,205,740,6115
```

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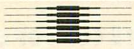

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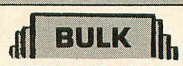


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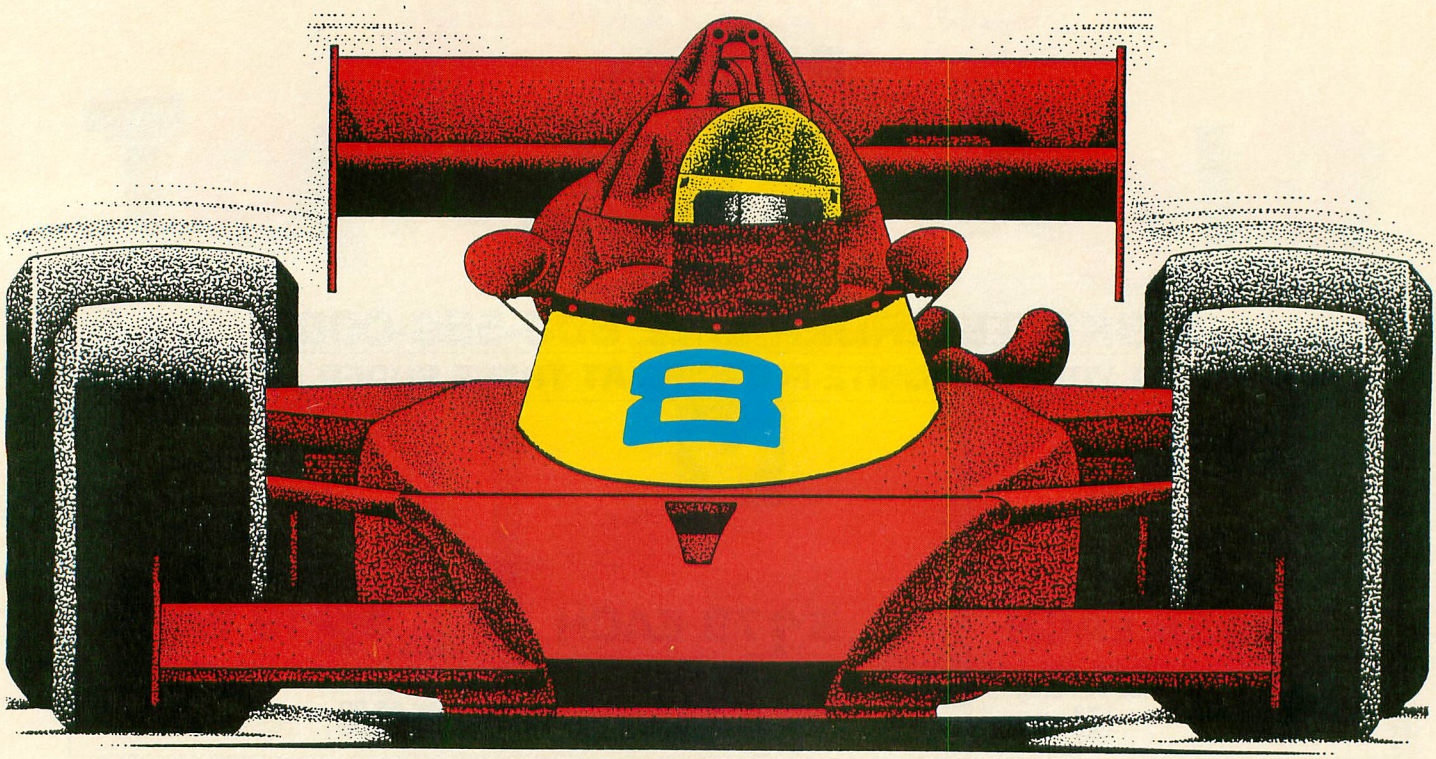
CIRCLE #116 ON READER SERVICE CARD



# RECKLESS RACER

16K Cassette or 24K Disk

by David Plotkin

Get ready to hop behind the wheel for this fast-action scrolling car-racing game. The object is to drive as far as you can, as fast as you can, without crashing your racing car.

You accumulate points faster if you drive faster, but the course has some nasty curves in it, and it's different every time you play the game. . . no memorizing the racetrack!

Your car appears at the bottom of the screen and moves left or right under joystick control. Pushing the stick forward speeds you up; pulling it back slows you down.

There are other cars on the road, and hitting one uses up one of your racing cars. Hitting one of the various obstacles which line the side of the road also uses up one car.

The game keeps track of your current speed, the score and your high score. Each time you complete one lap, the game gets harder, with more cars on the road. These other cars have a nasty tendency to weave back and forth, so look out! Now, go burn some rubber. □

```
100 DIM M$(32),S$(8),P$(8):OPEN #1,4,0
,"K:"
150 REM ** NEW CHARACTER SET **
155 REM ** ML routine for moving 1K **
160 FOR I=1 TO 32:READ A:M$(I)=CHR$(A)
:NEXT I
170 DATA 104,104,133,204,104,133,203,1
04,133,206,104,133,205,162,4,160,0,177
,203,145,205,136,208,249,230,204
175 DATA 230,206,202,208,240,96
177 REM ** Lower RAMTOP and move chara
cter set **
180 POKE 106,PEEK(106)-5:GRAPHICS 0:CS
=(PEEK(106)+1)*256:A=USR(ADR(M$),57344
,CS)
190 FOR I=CS+8 TO CS+47:READ A:POKE I,
A:NEXT I
195 DATA 0,24,60,126,126,60,24,0,0,189
,219,231,231,219,189,0,255,24,255,24,2
55,24,255,24
200 DATA 170,85,170,85,170,85,170,85,2
19,109,182,219,109,182,219,182
210 GRAPHICS 18:DL=PEEK(560)+256*PEEK(
561):A=PEEK(DL+4)+256*PEEK(DL+5):A=A+2
2:B=INT(A/256):C=A-B*256
220 POKE DL+4,C:POKE 88,C:POKE DL+5,B:
POKE 89,B:POKE DL+6,6:POKE DL+7,6
230 FOR I=17 TO 19:POKE DL+I+21,PEEK(D
L+I):NEXT I
240 FOR I=DL+8 TO DL+35 STEP 3:POKE I,
103:POKE I+1,146:POKE I+2,6:NEXT I:POK
E DL+35,71
```

```
245 POKE 756,C5/256:POKE 708,200:POSIT
ION 4,0:? #6;"INITIALIZING":SETCOLOR 0
,12,4:HIGH=0
250 REM ** DATA FOR ROADWAY **
255 RW=(PEEK(106)-10)*256
260 AA=1:II=1:FOR I=RW TO RW+512
262 AA=AA+II:IF AA>8 THEN II=-1.5*RND(
0)
263 IF AA<2 THEN II=1.5*RND(0)
264 AB=AA+141
267 POKE I,AB:NEXT I
270 POKE RW,25+141:POKE RW+512,114+141
300 REM ** PAGE SIX POKES **
310 RESTORE 315:FOR I=1536 TO 1748:REA
D A:POKE I,A:NEXT I
314 REM ** Change VBI vector **
315 DATA 104,160,17,162,6,169,7,76,92,
228
316 REM ** Init. data for VBI routine
**
317 DATA 1,1,0,0,0,0,0
318 REM ** VERT BLANK ROUTINE ** Deter
mine scroll value **
319 DATA 206,11,6,208,94,173,10,6,141,
11,6
320 DATA 173,12,6,206,16,6,74,176,250,
173,16,6,141,5,212,16,71
321 REM ** Move lines down **
322 DATA 169,16,141,16,6,173,48,2,133,
203
325 DATA 56,233,3,133,205,173,49,2,133
,204,133,206,160,37,177,205,145,203,13
6,177,205,145,203,136,136
330 DATA 192,10,208,241
331 REM ** Add a new line **
332 DATA 230,207,208,2,230,208,162,0,1
61,207,201,255,208,15,173,14,6,133,207
333 DATA 173,15,6,133,208,161,207,238,
13,6,136,145,203
335 DATA 173,0,211,72,41,8,208,2,230,2
09,104,41,4,208,2,198,209,165,209,141,
0,208,76,98,228
338 REM ** Screen roadway data **
340 DATA 4,5,5,5,5,67,130,1,1,130,67,4
,4,4,4,5,5,5,5,67,130,1,1,130,67,4,4,4
,4,5,5,5,5,67,130,1,1,130,67
341 DATA 4,4,4,4,5,5
342 REM ** Remove our VBI routine **
343 DATA 104,160,98,162,228,169,7,76,9
2,228
344 DATA 104,104,104,168,162,11,189,23
2,6,153,0,6,136,202,16,246,96
345 POKE 1550,0:POKE 1551,RW/256:POKE
207,0:POKE 208,RW/256
350 REM ** ROADWAY WIDTH **
370 FOR I=1690-2 TO 1693+2:POKE I,0:NE
XT I:FOR I=1710-2 TO 1713+2:POKE I,222
:NEXT I
400 REM ** PM GRAPHICS **
410 A=PEEK(106)-7:POKE 54279,A:PM=256*
A:POKE 559,46:POKE 53277,3:X=120:POKE
53248,X:POKE 209,X
415 RESTORE 430:POKE 705,100
420 FOR I=PM+512 TO PM+768:POKE I,0:NE
XT I:POKE 704,56:Y=90:FOR I=PM+512+Y T
O PM+522+Y:READ A:POKE I,A:NEXT I
430 DATA 24,90,126,90,24,60,165,165,23
1,189,153
440 FOR I=1 TO 8:READ A:P$(I,I)=CHR$(A
):NEXT I
450 DATA 106,96,85,76,63,51,40,22
460 FOR I=1768 TO 1779:READ A:POKE I,A
:NEXT I:DATA 0,0,0,0,90,126,90,24,60,1
65,231,189
470 PP=PM+640:HIGH=INT(PP/256):LOW=PP-
HIGH*256:POKE 1742,LOW:POKE 1743,HIGH
480 POSITION 0,0:? #6;"
    ";
```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CIRCLE #126 ON READER SERVICE CARD

```
490 POSITION 0,1:? #6;"PRESS FIRE BUTT
ON   WHEN READY TO START ";
492 IF STRIG(0)=1 THEN 492
495 A=USR(1536)
500 REM
502 POSITION 0,1:? #6;"SCORE
   ":POSITION 0,2:? #6;"       speed
   LAP"
504 REM ** RESET CLOCK - INIT. VAR. **
505 Z=0:POKE 18,Z:POKE 19,Z:POKE 20,Z:
LAP=0:OLD=0:NEW=0:POYNTS=0:DIST=220000
:CARS=5:FLAG=0:Y2=40:DIR=1
507 REM ** SPEED BYTES STRING **
510 RESTORE 520:FOR I=1 TO 8:READ A:S$
(I)=CHR$(A):NEXT I:N=1:TT=30
520 DATA 0,1,3,7,15,31,63,127
522 REM ** CK TRIGGER - CLEAR COLL. RE
G. **
525 T=PEEK(632):POKE 53278,0:IF FLAG=0
 THEN 532
527 Y2=Y2+N/2:D=USR(1732,Y2):IF Y2>130
 THEN Y2=40:FLAG=0:GOTO 540
529 DIR=DIR-2*(X2>150)+2*(X2<90):LDIR=
DIR*LAP/2:X2=X2+LDIR:IF LDIR>4 THEN LD
IR=4
530 POKE 53249,X2:GOTO 540
532 IF LAP*RND(0)>1 THEN Y2=40:POKE 70
5,(RND(0)*14+1)*16+10:FLAG=1:X2=120:PO
KE 53249,X2:D=USR(1732,Y2)
540 IF T=13 THEN N=N-1:IF N<1 THEN N=1
550 IF T=14 THEN N=N+1:IF N>8 THEN N=8
560 POKE 1548,ASC(S$(N,N))
570 L=PEEK(1549):IF L>LAP THEN GOSUB 2
010
572 IF CARS=0 THEN 610
573 REM ** COLLISION DETECTION **
575 IF PEEK(53252)=2 OR PEEK(53260)<>0
 THEN GOSUB 1010
577 REM ** PRINT SPEED - MOTOR SOUND *
*
580 POSITION 7,0:? #6;20*N;" "
584 SOUND 0,ASC(P$(N,N)),6,5+N
590 GOTO 525
600 REM ** FINISH ROUTINE **
610 SOUND 0,0,0,0:A=USR(1722)
620 POSITION 0,0:? #6;"SCORE = ";INT(P
OYNTS);"                "
630 IF POYNTS>HIGH THEN HIGH=POYNTS
640 POSITION 0,1:? #6;"HIGH SCORE = ";
INT(HIGH);"              "
650 POSITION 0,2:? #6;"Again? Press Tr
igger"
655 IF STRIG(0)=0 THEN 655
660 IF STRIG(0)=1 THEN 660
670 GOTO 310
1000 REM ** COLLISION SUBROUTINE **
1010 FOR I=0 TO 3:SOUND I,50+20*I,2*I+
2,12:NEXT I
1020 FOR I=N TO 1 STEP -1
1030 N=I:POKE 1548,ASC(S$(N,N)):POKE 7
12,N*16+8:POKE 704,N*16+10:FOR J=1 TO
10:NEXT J:NEXT I
1040 CARS=CARS-1
1050 FOR I=PP+Y2-12 TO PP+Y2:POKE I,0:
NEXT I:FLAG=0:X2=120:Y2=40
1090 POKE 704,56:POKE 712,0:FOR I=0 TO
 3:SOUND I,0,0,0:NEXT I:RETURN
2000 REM ** NEW LAP SUBROUTINE **
2005 REM ** Ck. clock for lap time - c
alc. speed **
2010 LAP=L:NEW=PEEK(20)+256*PEEK(19)+2
56*256*PEEK(18):POYNTS=POYNTS+DIST/(NE
W-OLD)
2020 POSITION 1,0:? #6;INT(POYNTS);"
 ":OLD=NEW
2025 POSITION 18,0:? #6;LAP
2030 RETURN
```


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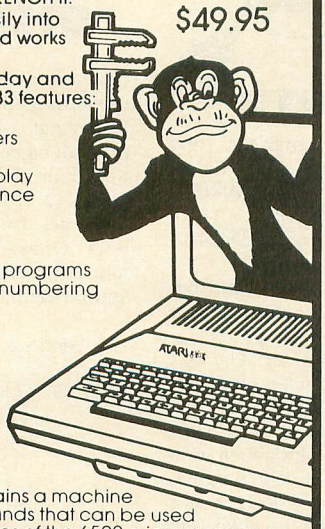

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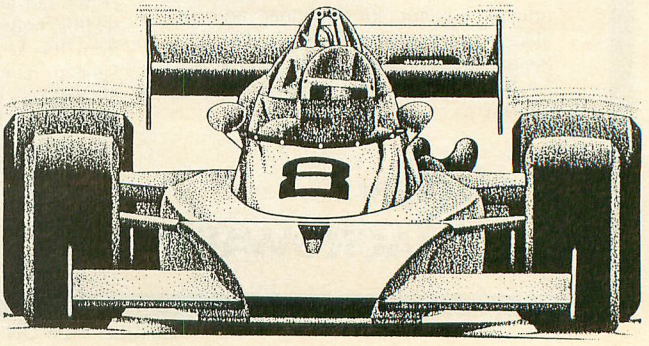
CIRCLE #127 ON READER SERVICE CARD


## CHECKSUM DATA.

*(see page 20)*

```
100 DATA 858,200,806,614,970,659,206,7
08,275,250,151,147,804,456,624,7728
245 DATA 375,789,145,25,149,782,869,74
0,726,680,290,903,394,303,700,7870
318 DATA 988,536,488,477,340,339,619,2
73,74,766,629,381,457,302,755,7424
343 DATA 877,209,45,521,568,270,507,86
3,958,21,41,751,800,645,245,7321
490 DATA 563,271,44,82,185,660,372,70,
413,161,499,724,2,947,264,5257
532 DATA 213,672,722,153,75,19,447,589
,45,665,839,737,864,526,715,7281
630 DATA 104,149,787,266,254,721,679,1
97,386,31,421,174,637,293,974,6073
2010 DATA 705,126,480,784,2095
```



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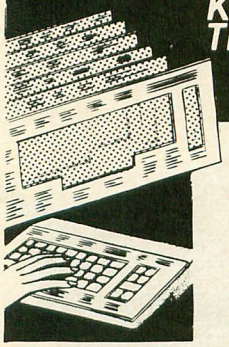

- "AT-A-Glance" summarizes all commands required to learn and operate your programs
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CIRCLE #130 ON READER SERVICE CARD


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

```
♥ --- CTRL ,
├ --- CTRL A
| --- CTRL B
┘ --- CTRL C
┤ --- CTRL D
┐ --- CTRL E
/ --- CTRL F
\ --- CTRL G
◢ --- CTRL H
  --- CTRL I
◣ --- CTRL J
▝ --- CTRL K
▖ --- CTRL L
▬ --- CTRL M
▁ --- CTRL N
▘ --- CTRL O
┼ --- CTRL P
┌ --- CTRL Q
▔ --- CTRL R
┼ --- CTRL S
● --- CTRL T
▄ --- CTRL U
▏ --- CTRL V
┬ --- CTRL W
┴ --- CTRL X
▌ --- CTRL Y
└ --- CTRL Z
ESC ESC
↑ --- ESC CTRL UP-ARROW
↓ --- ESC CTRL DOWN-ARROW
← --- ESC CTRL LEFT-ARROW
→ --- ESC CTRL RIGHT-ARROW
♦ --- CTRL .
♠ --- CTRL ;
▚ --- ESC SHIFT CLEAR
▌ --- ESC BACK S
▐ --- ESC TAB
▒ --- INVERSE CTRL ,
▒ --- INVERSE CTRL A
▒ --- INVERSE CTRL B
▒ --- INVERSE CTRL C
▒ --- INVERSE CTRL D
▒ --- INVERSE CTRL E
▒ --- INVERSE CTRL F
▒ --- INVERSE CTRL G
▒ --- INVERSE CTRL H
▒ --- INVERSE CTRL I
▒ --- INVERSE CTRL J
▒ --- INVERSE CTRL K
▒ --- INVERSE CTRL L
▒ --- INVERSE CTRL M
▒ --- INVERSE CTRL N
▒ --- INVERSE CTRL O
▒ --- INVERSE CTRL P
▒ --- INVERSE CTRL Q
▒ --- INVERSE CTRL R
▒ --- INVERSE CTRL S
▒ --- INVERSE CTRL T
▒ --- INVERSE CTRL U
▒ --- INVERSE CTRL V
▒ --- INVERSE CTRL W
▒ --- INVERSE CTRL X
▒ --- INVERSE CTRL Y
▒ --- INVERSE CTRL Z
▒ --- ESC DELETE
▒ --- ESC INSERT
▒ --- ESC CTRL TAB (CLR)
▒ --- ESC SHIFT TAB (SET)
▒ --- INVERSE SPACE
▒ --- INVERSE _
▒ --- INVERSE CTRL .
▒ --- INVERSE CTRL ;
▒ --- INVERSE |
▒ --- ESC CTRL 2
▒ --- ESC CTRL BACK S
▒ --- ESC CTRL INSERT
```

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by Charles Bachand

Once in a while I'm handed two products that—on the surface—seem quite similar, but, on further investigation, they're revealed to be like the proverbial apples and oranges. This was the case with the two new printer buffers reviewed here. Both devices replace the Atari 850 interface module, and both contain RAM that holds data being sent to the printer, but there the similarities end. Who said a reviewer's life was an easy one?

### U-Print.

The **U-Print** can be thought of as an **Ape-Face** interface—with a *bunch* of goodies thrown in (the **Ape-Face** also retailed for $89.95). Digital Devices appears to have won "The Battle of the Atari Interfaces" by giving their little black box several features normally associated with more expensive brands.

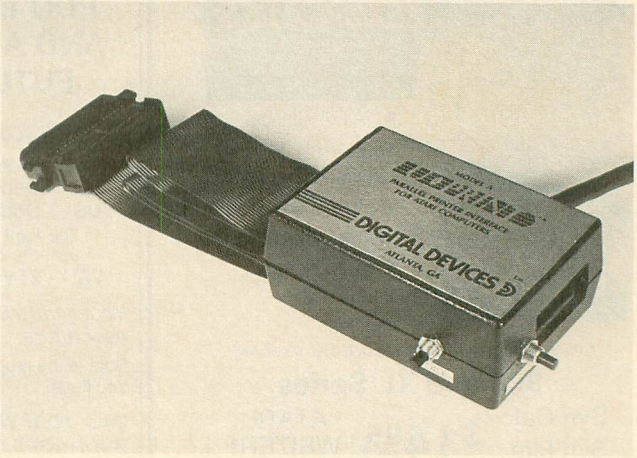
1. **U-Print** has two Atari connectors, in order to allow the use of the old 410 program recorders. The extra connector was sadly lacking on the **Ape-Face**, and it's inclusion here will make quite a few people happy.

2. Total cable length has been increased—there are over 6 feet! This will allow you to locate the printer almost anywhere in the room, not just on that little coffee table situated 6 inches from your computer.

3. While the old **Ape-Face** had no provisions for internal print buffering, **U-Print** comes with a 16K buffer built in. The buffer size can be expanded to 32K by the user via the insertion of two extra 4164-15 dynamic RAM chips. Digital Devices allows you to do the memory upgrade yourself, simply by removing four screws and inserting the new IC chips into their sockets, all without voiding the warranty—provided that the memory chips you use were supplied by Digital Devices.

4. Multiple copies of documents (up to 255) can be produced by the simple push of one of two buttons on the interface. If you need five copies of a letter, just push the COPY button five times before sending text to the printer.

5. If you wish to abort a printout once it has begun, simply press the other button on the **U-Print**, marked RESET. The interface will be returned to its power-up condition.




**U-Print.**

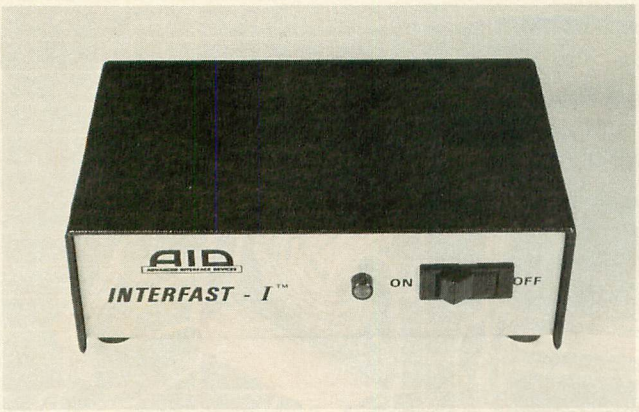
Our review copy of **U-Print** came with the 32K memory option and has increased my productivity by the mere fact that I no longer have to wait while my computer talks to a slow printer. It only took 20 seconds to send the text for this review to **U-Print**, and it took my printer over four minutes to actually print it out—but I was able to get back to work after that 20 seconds.

### Interfast-I.

The **Interfast-I** is an entirely different kettle of fish. With only 4K of buffer space and the more expensive price of $129.95, it might not seem to be too practical. But, believe me, this interface does more than meets the eye. The **Interfast-I** printer interface is a fully self-contained 6502 computer that can have software sent to it from the Atari in order to customize its operation. This can serve several strange and useful purposes.

1. Printer interfaces automatically change all ATASCII bytes representing carriage returns (155 decimal, $9B hexidecimal) to their corresponding ASCII values (13 decimal, $0D hexidecimal). This can be disabled in the **Interfast-I**, to allow for the proper handling of graphics and screen dumps.

2. The equivalent of the character set used in the Atari can be downloaded to the **Interfast-I**, thus allowing characters to be printed out exactly as they appear on your video screen. Unlike a screen dump program that sends the graphic information to your printer, with **Interfast-I** your Atari need only send the character data. The interface then does all the work of conversion to graphics.




**Interfast-I.**

3. Another interesting application is apparent when the **Interfast-I** is used in conjunction with Advanced Interface Devices' RS-232 interface converter, the R-VERTER. The **Interfast-I** can be programmed to listen in on the data going from the R-VERTER to your computer, and to print it at the same time. This method saves considerable telecommunications connect time, since the computer does not have to accept a line of data and then re-send it to the printer—as it does when an Atari 850 interface module is used.

The **Interfast-I** manual is a hardware and software programmer's dream. While other companies try to hide the inner workings of their machines, A.I.D. can't seem to tell you enough.

A fully-commented memory map and a command table listing are included, as well as a schematic diagram of the interface, timing specifications, listings of parallel port pinouts and a listing of **Interfast-I**'s operating system entry points. A diskette of useful utilities and the commented source code listing for the interface's operating system are also available.

Even with all of this, the **Interfast-I** is still somewhat deficient—in the RAM department. 4K just doesn't cut it any more, and 16K is what most consider absolute minimum. Still, if the ability to program your interface outweighs the lack of extensive onboard RAM, and the price tag doesn't make you fall down and start foaming at the mouth, then the **Interfast-I** might be for you.

**Apples and oranges.**

It turns out that, in this review, there is no clear-cut winner. Let's just say that they're both winners, since each is tops in what it does! Now, let's see, I'll connect the **U-Print** to the Epson that I use for word processing, and the **Interfast-I** can go with. . . □

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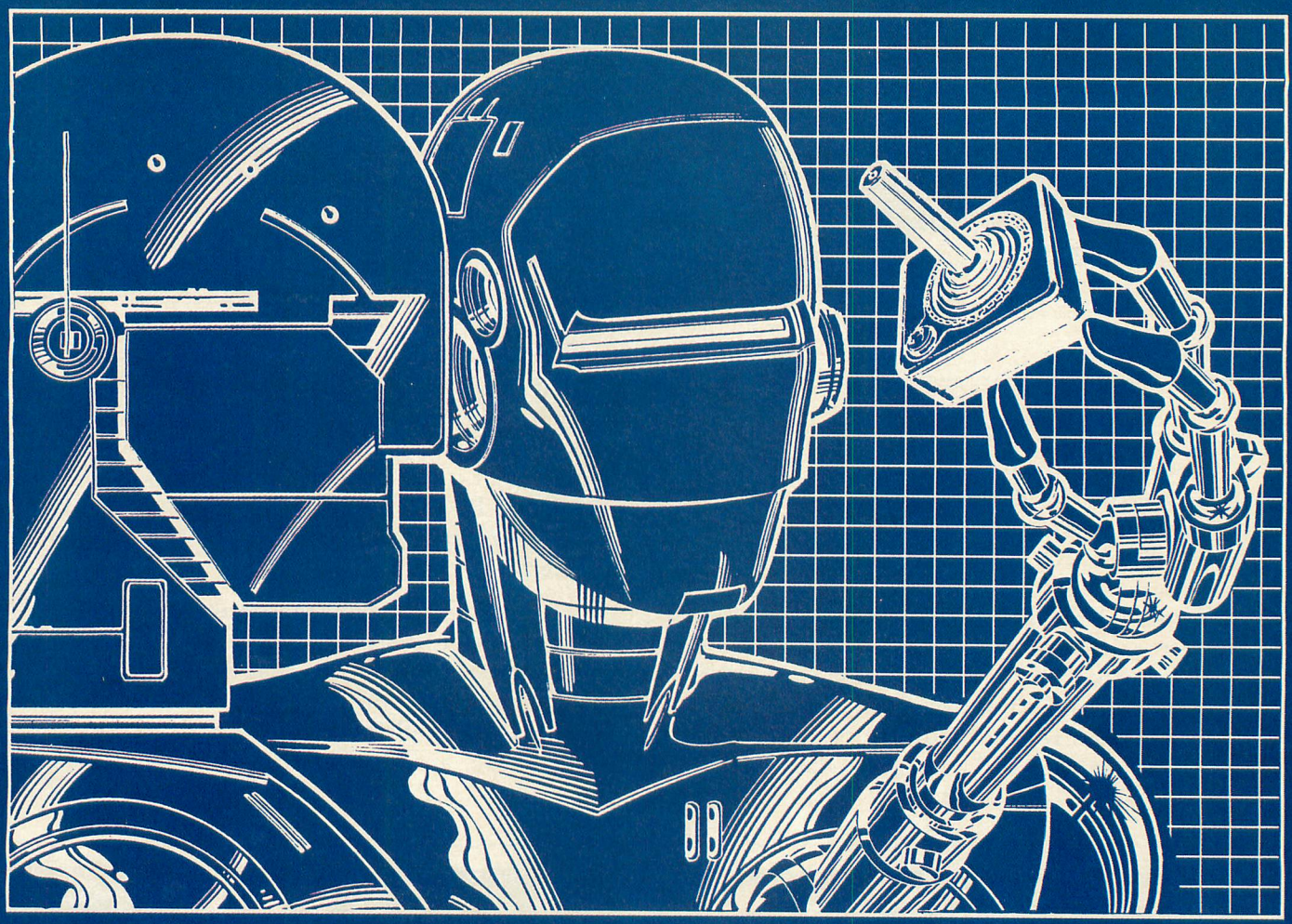


# ANDROTON

40K Disk (Requires Minicomp)

by David Bohlke

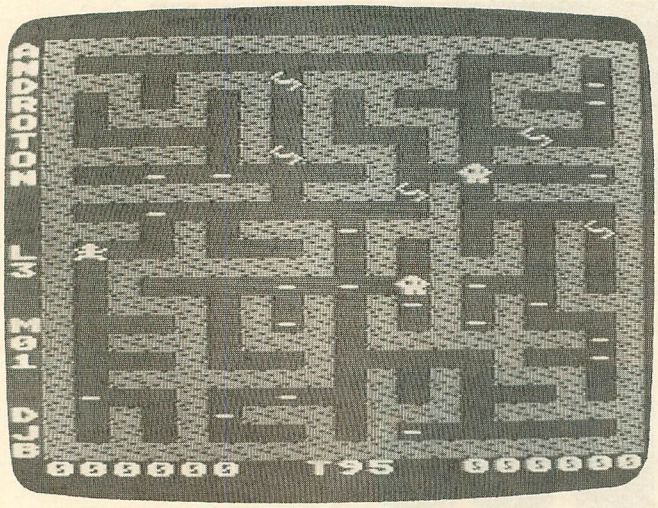
***Androton** is a game that has been designed to be used with **Minicomp**, a BASIC compiler also written by David Bohlke, which appeared in issue 23. If you do not have issue 23 of **ANALOG Computing**, it is available as a back issue (see page 95). — Ed.*

One of the comments I hear most often is, "How can you write an arcade-style game using only the eleven statements the **Minicomp** program can compile?" When you consider all the enhanced commands of BASIC that make programming easy for us, then this is a legitimate concern.

But what makes BASIC run? It is the machine language interpreter, and—as I understand it—machine language has four major groups of commands. You can move and store data between memory locations; you can add and compare memory locations; you can branch to different segments of your program; and you can have direct processor control.

Even though **Minicomp** has just eleven commands, it (like BASIC) has the capability to perform most of the functions of machine language, with the exception of direct processor control. With **Minicomp**, you can move and store data using PEEK and POKE; you can add and compare data using A=B+C and IF. . .THEN; and you can branch to different parts of the program with GOTO and GOSUB.

Considering these general capabilities, it shouldn't be too surprising that it is possible to write longer games using the compiler. **Androton** is presented in this article as an example of an arcade-style game written with the **Minicomp** statement set.




**Androton.**

**Androton** features a graphics 1 screen, a redefined character set, a full screen random maze each time you clear the board, color, sound, high score, game timer, bonus score and one- or two-player option. All these functions make the program listing fairly long, and the **Minicomp** compiler (written in BASIC) will require about twenty-five minutes to compile this program.

Fortunately, if you save the object code to disk or tape, you'll only need to compile it once. But the compile time raises an interesting conjecture: can you compile the compiler? In other words, is it possible to rewrite the **Minicomp** listing using only line numbers 1-999 and the eleven **Minicomp** statements? If so, compile time should be about 100 times faster. Would this mean that **Minicomp**'s eleven-statement set is quite powerful—if it can, in fact, compile itself? Seems like a good topic for a future article. . .

**And now, Androton.**

I believe you'll really enjoy this game. It is one of my favorites—mostly, I think, because it is possible to achieve very high scores. Another plus in this **Pac-Man**-like action is the option that allows two players to participate at the same time, in a co-op fashion.

To begin the compile process, power up your system and RUN the INIT96 program to adjust LOMEM, then type in the program listing. Be sure to LIST the program to disk or tape before you proceed. If you want to RUN the BASIC listing of the game at this time, you'll need to be patient, as the code runs extremely slowly. When you are ready to compile the program, ENTER the **Minicomp** compile from disk or tape. You'll notice that the **Androton** listing has some line numbers beyond 999. Specifically, the coding at Line 9500 will put the new character set into low memory. This will be explained further later on, but, for now, type GOTO 9500 then RETURN to move the character set.

Next, type *GOTO 1000* and RETURN to initiate the compile process. When the program has been compiled, a *RETURN* prompt will be displayed on the upper right of the screen. Make a note of the end of the object code buffer (around 22000). Now you can execute the game by pressing RETURN.

Before you begin play, and at the end of each game, the program will be in the attract mode. At this time, you can press the SELECT key for the one- or two-player option (joystick slot 1, slot 2). Also, the speed of the deadly blue droids will be printed in the center of the maze. This speed difficulty level can be altered from the fastest setting of 1 to the slower setting of 5 by pressing the OPTION key. To the maze's left, the maze number (M) and lives remaining (L) will be displayed. The bottom screen line will show the current score, high score and the time remaining (T) for you to clear the maze. Once you press START, play will begin.

*(continued on page 43)*

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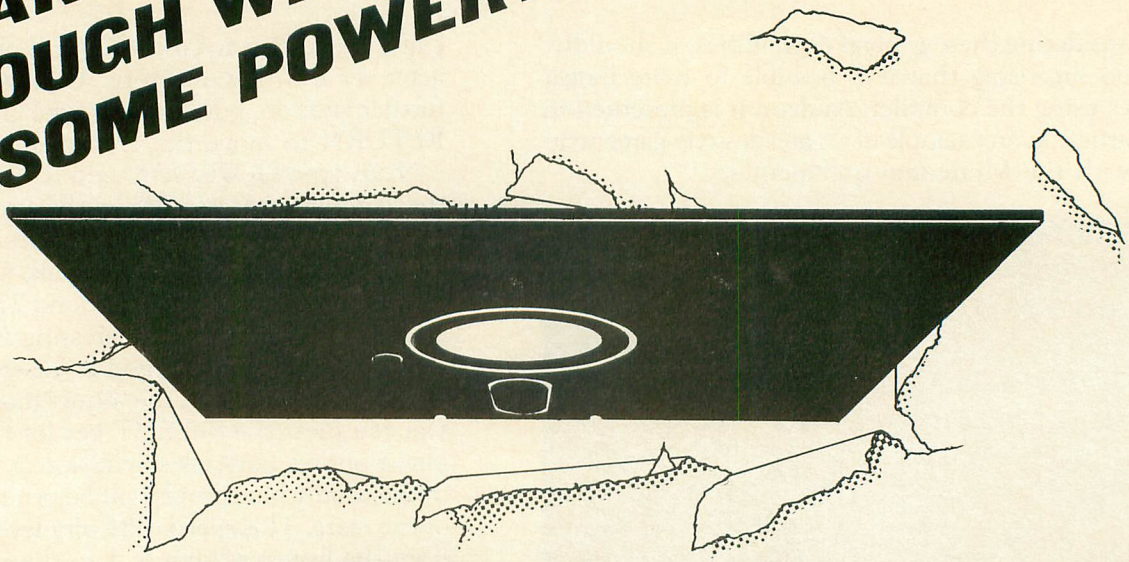

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*An advanced version is available to TOP-DOS owners (at additional cost), which doubles the number of files, as well as adding a number of other features.

CIRCLE #133 ON READER SERVICE CARD

### Let the play begin.

Push the stick in the four cardinal directions to move your green man through the maze, trying to pick up the pulsing blue proton bars. For each red trip sensor you cross, an additional blue droid will be released to hunt you down. If any droid touches you, or if the timer runs to zero before you can collect all the bars, you'll lose one life. Once you collect all the bars in the maze, a new random maze will be constructed, and your adventure begins again.

For each proton bar you pick up, your score will be incremented by the maze number in which you currently find yourself. Each 10,000 points, you will be rewarded with an extra life (the maximum is nine). Finally, whenever you clear the maze by collecting all the proton bars, you will receive a bonus score equal to the maze number times ten for each tick left on the timer.

### Checking out the routines.

I have included a line listing description for **Androton** and also a description for the major variables used. You can use these two charts to investigate how some of the game's routines are set up.

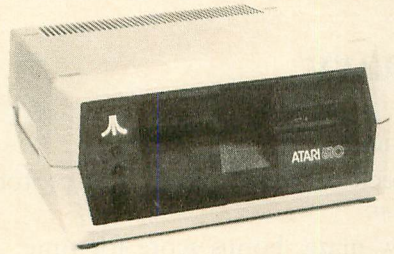
Of special note is the code at 9500 to initiate a new character set. Line 9502 will move the character set in ROM to memory location 11776 (page 46). This area of memory is above DOS I, yet below the object code buffer (12288). Line 9510 will read and place several new characters into the character set. The routine at 9500 will not be compiled, but after the character set is moved to page 46 (by typing *GOTO 9500*), it can be saved to disk or tape, along with the object code buffer (after you compile **Androton**) by using 11776 as the beginning address for the save.

This save ability makes page 46 an extremely useful location to store character sets, messages, large amounts of data or special screen images, all of which can be easily accessed by the compiled code.

Another program listing section of general interest is that in Lines 50-59. This code will develop a graphics 1 display list located at decimal 1536, plus move the display memory to decimal 24064 (page 94). We must create our own display list, because **Minicomp** cannot compile the GRAPHICS command from BASIC. I like to use graphics 1, because you can utilize five colors (plus P/M colors) in this mode, and it requires less than 500 bytes for display memory.

### Expanded routines.

Several routines from last month's program were expanded for **Androton**. The game uses three timers: one controls the speed of the blue droids; another keeps track of the countdown game timer; and the

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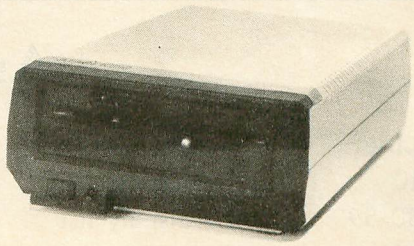

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third slows down the movement of your players.

A data table is also used to store the location and direction of each droid. In additional to the regular running score, a high score is displayed on the lower right screen line. Also, in **Androton**, we have to read two STICK positions for the two-player option. The locations of all these routines are identified in the line summary chart (Figure 1).

Sound is generated through the use of memory locations 53760 and 53761. The command SOUND 0,A,B,C can be duplicated by using POKE 53760,A: POKE 53761,B*16+C. In a similar manner, locations 53762 and 53763 can be used to set up sound channel 1 (SOUND 1,A,B,C). You'll have to adjust your sound routines, though—to the extremely fast speed of machine language.

We have covered a lot of material this month, and I'm sure there are a lot of questions left unanswered. The routine starting at Line 800, for example, constructs the entire random maze with a fairly simple algorithm—but it would take several pages to explain completely. For now, I would prefer to use my print space to introduce you to several different games in the coming months. Then, when I get some feedback from you, perhaps I can concentrate on more specific routines utilizing **Minicomp**. □

Figure 2.

| Androton Variable List | |
|---|---|
| DS | Display memory start |
| CS | Location of character set |
| T1 | Game cycle timer |
| T2 | Player timer |
| T3 | Droid timer |
| AT | Droid table |
| AI | Index to droid table |
| MP | Man POKE number |
| AP | Droid POKE number |
| NB | Number of proton bars in maze |
| LV | Number of lives |
| TI | Countdown time remaining |
| MZ | Maze cycle number |
| SP | Speed of droids |
| NA | Number of active droids |
| SC | Current score |
| P1 | Player 1 location |
| P2 | Player 2 location |
| NP | Number of players |
| ST | Stick being read |
| EG | End of game flag |
| NL | New life counter |

Figure 1.

# Androton Line Summary

| Line | Function |
|---|---|
| 10 | Initialization |
| 50-59 | GR.1 display list |
| 60 | Colors |
| 90-92 | Color, zero score line |
| 95 | Initial variables |
| 100-198 | New game routine |
| 110-115 | Check option keys |
| 130-132 | One or two players |
| 140-142 | Speed option |
| 180-198 | Check if new high score |
| 200-290 | New maze routine |
| 200-205 | Set up droid table/directions |
| 260-265 | Set proton bars in maze |
| 282-285 | Set trip wires in maze |
| 290 | Print routines |
| 300-399 | Logic to move droids |
| 400-490 | Move players |
| 450 | Player captured proton bar |
| 460 | Player hit droid (lose life) |
| 470 | Player hit trip wire |
| 500-506 | Check if maze is cleared of proton bars |
| 510-530 | New maze, bonus score for time remaining |
| 570-572 | Lose life |
| 615-622 | Exchange droid character for animation |
| 670-672 | New life each 10000 points |
| 680-685 | Game timer, speed for one or two players |
| 700-704 | Print title |
| 710-712 | Digits in time display |
| 720 | Print lives |
| 730 | Print maze number |
| 740 | Print time numbers |
| 750 | Zero sound |
| 800-897 | Compute and plot random maze |
| 900-904 | Multiply routine |
| 910-914 | Divide routine |
| 950-959 | Increment score |
| 9500-9534 | New character set (not compiled) |

Androton.
Listing 1.

```
10 Z=0:W=1:DS=24064:OP=53279:R=53770:T
1=540:T2=542:T3=544:CS=11776:AT=11400
50 P=1536:A=112:GOSUB 59:GOSUB 59:GOSU
B 59:A=70:GOSUB 59:A=Z:GOSUB 59:A=94:G
OSUB 59:B=Z:C=23
53 A=6:GOSUB 59:B=B+W:IF B<C THEN 53
54 A=65:GOSUB 59:A=Z:GOSUB 59:A=6:GOSU
B 59
55 A=559:POKE A,Z:A=560:POKE A,Z:A=561
:B=6:POKE A,B:A=559:B=46:POKE A,B:GOTO
 60
59 POKE P,A:P=P+W:RETURN
60 A=756:B=46:POKE A,B:A=712:B=2:POKE
A,B:A=710:B=134:POKE A,B:A=708:B=228:P
OKE A,B
90 A=711:B=72:POKE A,B:A=474:A=A+DS:B=
6:B=B+A:C=208
92 POKE A,C:A=A+W:IF A<B THEN 92
95 NP=W:SP=25:MP=77:AP=140:E=48:G=104:
GOSUB 402
100 GOSUB 800:GOSUB 750:GOSUB 700
110 A=PEEK(OP):B=6:IF A=B THEN 150
112 B=5:IF A=B THEN 130
114 B=3:IF A=B THEN 140
115 GOTO 110
130 IF NP=W THEN 132
131 NP=W:GOTO 100
132 NP=2:GOTO 100
140 A=5:SP=SP+A:B=26:IF SP<B THEN 100
142 SP=5:GOTO 100
150 NB=20:MZ=W:LV=3:SC=Z:NL=80
180 A=461:B=467:C=474:D=128
182 E=A+DS:F=PEEK(E):G=C+DS:H=PEEK(G):
F=F+D:IF F<H THEN 196
183 IF H<F THEN 192
184 A=A+W:C=C+W:IF A<B THEN 182
192 A=461:B=467:C=474:D=128
193 E=A+DS:F=PEEK(E):E=C+DS:F=F+D:POKE
 E,F
194 A=A+W:C=C+W:IF A<B THEN 193
196 A=461:B=467:C=80
197 P=A+DS:POKE P,C:A=A+W:IF A<B THEN
197
198 A=180:B=469:B=B+DS:POKE B,A
200 A=AT:B=25
202 C=11:POKE A,C:A=A+W:C=10:POKE A,C:
A=A+W:POKE A,Z:A=A+W
204 C=PEEK(R):D=3:IF D<C THEN 204
205 C=C+W:POKE A,C:A=A+W:AI=AI+W:IF AI
<B THEN 202
250 GOSUB 800:B=2:NA=B
260 A=0
262 B=PEEK(R):C=225:IF C<B THEN 262
263 B=B+B:B=B+DS:C=PEEK(B):IF C=Z THEN
 265
264 GOTO 262
265 E=139:POKE B,E:A=A+W:IF A<NB THEN
262
280 A=MZ:B=4:GOSUB 910:AI=Z:B=5:E=C+B:
F=Z
282 B=PEEK(R):C=225:IF C<B THEN 282
283 B=B+B:B=B+DS:C=PEEK(B):IF C=Z THEN
 285
284 GOTO 282
285 G=202:POKE B,G:F=F+W:IF F<E THEN 2
82
290 TI=99:A=77:POKE A,Z:GOSUB 700:GOSU
B 720:GOSUB 730:A=230:A=A+DS:POKE A,Z
300 A=PEEK(T3):IF Z<A THEN 400
304 POKE T3,SP:A=4:B=AI:GOSUB 900:A=C+
AT:L=A:IF NA=Z THEN 400
305 M=PEEK(A):A=A+W:N=PEEK(A):A=A+W:O=
PEEK(A):A=A+W:Q=PEEK(A)
306 A=53760:B=PEEK(R):POKE A,B:A=53761
:B=132:POKE A,B
310 A=20:B=M:GOSUB 900:H=C+N:H=H+DS:GO
SUB 390:I=M:J=N:IF A=W THEN 320
312 F=Q+W:A=5:IF F<A THEN 322
313 F=W:GOTO 322
320 F=Q-W:IF Z<F THEN 322
321 F=4
322 G=H:GOSUB 890:A=PEEK(G):IF A=W THE
N 330
323 IF A=MP THEN 570
325 Q=F:GOTO 370
330 I=M:J=N:F=Q:G=H:GOSUB 890:A=PEEK(G
):IF A=W THEN 350
333 IF A=MP THEN 570
335 Q=F:GOTO 370
340 I=M:J=N:F=Q+W:C=5:IF F<C THEN 342
341 F=W
342 G=H:GOSUB 890:A=PEEK(G):IF A=W THE
N 347
343 IF A=MP THEN 570
345 Q=F:GOTO 370
347 Q=Q+W:C=5:IF Q<C THEN 340
348 Q=W:GOTO 340
350 GOSUB 390:IF A=W THEN 340
352 I=M:J=N:F=Q-W:IF Z<F THEN 354
353 F=4
354 G=H:GOSUB 890:A=PEEK(G):IF A=W THE
N 357
355 GOTO 343
357 Q=Q-W:IF Z<Q THEN 352
358 Q=4:GOTO 352
370 IF O=AP THEN 372
371 GOTO 380
372 O=Z
380 POKE H,O:POKE G,AP
384 POKE L,I:L=L+W:POKE L,J:L=L+W:POKE
 L,A:L=L+W:POKE L,Q
385 AI=AI+W:IF AI<NA THEN 400
386 AI=Z:GOTO 400
390 A=Z:IF AI=W THEN 399
391 B=3:IF AI=B THEN 399
393 B=5:IF AI=B THEN 399
394 B=7:IF AI=B THEN 399
395 A=W
399 RETURN
400 A=PEEK(T2):IF Z<A THEN 500
401 A=8:POKE T2,A:E=16:G=96:GOSUB 402:
E=48:G=104:GOSUB 402:GOTO 405
402 A=PEEK(R):B=64:GOSUB 910:A=C:B=8:G
OSUB 900:A=E+C:A=A+CS:B=CS+G:C=8:C=C+A
403 F=PEEK(A):POKE B,F:A=A+W:B=B+W:IF
A<C THEN 403
404 RETURN
405 X=P1:ST=632:GOSUB 410:P1=X:IF EG=W
 THEN 570
406 IF NP=W THEN 500
408 X=P2:ST=633:GOSUB 410:P2=X:IF EG=W
 THEN 570
409 GOTO 500
410 EG=Z:E=X:F=20
411 A=PEEK(ST):B=14:IF A=B THEN 420
412 B=5:IF A=B THEN 422
413 B=9:IF A=B THEN 424
414 B=10:IF A=B THEN 426
415 B=6:IF A=B THEN 420
416 B=7:IF A=B THEN 422
417 B=13:IF A=B THEN 424
418 B=11:IF A=B THEN 426
419 GOTO 490
420 E=E-F:GOTO 430
422 E=E+W:GOTO 430
424 E=E+F:GOTO 430
426 E=E-W:GOTO 430
430 A=53760:B=90:POKE A,B:A=53761:B=10
2:POKE A,B:N=E+DS:A=PEEK(N):IF A=Z THE
N 480
432 IF A=W THEN 490
434 B=139:IF A=B THEN 450
435 B=202:IF A=B THEN 470
436 IF A=AP THEN 460
440 GOTO 490
450 SC=SC+MZ:GOTO 480
460 EG=W:GOTO 490
470 NA=NA+W:A=8:IF NA<A THEN 480
472 NA=8
480 A=X+DS:POKE A,Z:X=E:POKE N,MP
490 RETURN
500 A=DS:B=460:B=A+B:C=139
505 D=PEEK(A):IF D=C THEN 600
506 A=A+W:IF A<B THEN 505
510 MZ=MZ+W:A=3:NB=NB+A:A=70:IF NB<A T
HEN 515
512 NB=A
515 IF TI=Z THEN 200
516 B=TI+TI:B=B+TI:A=53760:POKE A,B:A=
53761:B=166:POKE A,B
```

# ATARI®

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## DISK DRIVES

| | |
|---|---|
| Rana 1000 | $298 |
| Astra 2001 | $549 |
| Indus GT | $309 |
| Trak AT-D2 | $329 |
| Trak AT-1 | $319 |
| Trak AT-D4 | Call |
| Astra 1620 (Dual) | $499 |
| Percom | Call |
| Atari 1050 | $249 |

## MEMORIES

| | |
|---|---|
| Microbits 64K (XL) | $115 |
| Mosaic 48K (400) | $98 |
| Mosaic 64K (400/800) | Call |
| Mosaic 32K | $68 |

## INTERFACES

| | |
|---|---|
| Axiom 846 | Call |
| Ape Face | Call |
| Atari 850 (In Stock) | $169 |
| Interfast 1 | $150 |
| Microbits 1150 | Call |
| R-Verter | Call |

## DIRECT PRINTERS

| | |
|---|---|
| Axiom AT-100 | $195 |
| Atari 1027 | $269 |
| Axiom 550 AT | $259 |
| Axiom 700 AT | $469 |
| Atari 1025 | $299 |

## DIRECT MODEMS

| | |
|---|---|
| Microbits 1000C | $128 |

## OTHER ATARI

| | |
|---|---|
| 400 Keyboard | Call |
| Koala Pad | $67 |
| Chalkboard Pad | $75 |
| Bit-3 80 Column | $228 |
| ATR-8000 (64K) | $489 |
| ATR-8000 (16K) | $359 |
| Alien Voice Box | $98 |
| 1010 Recorder | $74 |

## GEMINI 10X $259.00

## ATARI SOFTWARE

### MISCELLANEOUS

| | |
|---|---|
| Syn Calc (D) | $59 |
| Syn File (D) | $59 |
| Syn Trend (D) | $48 |
| Syn Com (D) | $29 |
| Syn Chron (D) | $29 |
| Decathlon (R) | $29 |
| Drols (D) | $23 |
| Gyruss (R) | $31 |
| Heist (D) | $23 |
| Bruce Lee (C/D) | $27 |
| Universe (D) | Call |
| Questron (D) | $34 |
| Koala Coloring I | $20 |
| Koala Logo Design | $27 |
| Bumble Games (D) | $27 |
| Miles Accounting | Call |
| *World Gtst. Baseball* | $23 |
| Gridrunner (R) | $20 |
| Sargon II (C/D) | $23 |
| Millionaire (D) | $34 |
| Castle Wolfenstein (D) | $20 |
| Odesta Chess (D) | $46 |
| Financial Wizard (D) | $41 |
| Ultima III (D) | $39 |

### ADVENTURE INT'L

| | |
|---|---|
| Adv. 1-12 each (C) | $18 |
| Preppie (C/D) | $20 |
| Preppie II (C/D) | $23 |
| Diskey (D) | $33 |
| Sea Dragon (C/D) | $23 |
| Lunar Lndr (C) $11 (D) | $15 |
| Galactic Empire (C) | $14 |

### ADVENTURE INT'L

| | |
|---|---|
| Ultra Disassembler (D) | $33 |
| Diskey (D) | $33 |
| Adv. 1-12 (each) (C) | $18 |
| Saga 1-12 (each) (D) | $27 |

### ATARI

| | |
|---|---|
| Atari Writer (R) | $68 |
| Paint (D) | $30 |
| Microsoft Basic II (R) | $64 |
| Visicalc (D) | $139 |
| Home File Mgr (D) | $36 |
| Assembler Editor (R) | $44 |
| Qix (R) | $32 |
| Dig Dug (R) | $32 |
| Atari Logo (R) | $72 |
| Ms. Pac Man (R) | $33 |
| Joust (R) | $33 |
| Donkey Kong Jr. (R) | $35 |
| Computer Chess (R) | $24 |
| Galaxian (R) | $30 |
| Defender (R) | $30 |
| ET | $34 |
| Pac Man (R) | $30 |
| Centipede (R) | $30 |
| Caverns of Mars (D) | $28 |
| Star Raiders (R) | $30 |
| Conv. Lang. Ea. (C) | $42 |
| Asteroids (R) | $27 |
| Space Invaders (R) | $27 |
| Missile Command (R) | $27 |
| Telelink (R) | $21 |
| Family Finance (D) | $35 |
| Prog. 1 (C) | $18 |

### AVALON HILL

| | |
|---|---|
| Telengard (C) $16 (D) | $19 |
| Close Assault (C) 20 (D) | 23 |
| TAC (D) | $27 |
| Space Station Zulu (D) $17 (C) | $14 |
| Flying Ace (D) $21 (C) | $18 |
| GFS Sorceress (D) $23 (C) | $20 |

### AVALON HILL(Cont'd)

| | |
|---|---|
| Moon Patrol (C) | $17 |
| B-1 Nuc. Bomber (C) | $12 |
| Legionnaire (C) | $23 |
| Empire of Overmind (D) $23 (C) | $20 |
| Tanktics (D) $20 (C) | $17 |
| Comptr Stock & Bonds (D) $17 (C) | $14 |
| Galaxy (D) $17 (C) | $14 |
| Nuke War (C) | $12 |
| Andromeda Conquest (D) $16 (C) | $13 |
| Close Assit (D) $23 (C) | $20 |

### BRODERBUND

| | |
|---|---|
| Sky Blazer (D) | $22 |
| Bank St. Writer (D) | $46 |
| A.E. (D) | $23 |
| Arcade Machine (D) | $39 |
| Choplifter (D) $23 (R) | $29 |
| Labyrinth (C/D) | $20 |
| Serpentine (D) $23 (R) | $27 |
| Steller Shuttle (C/D) | $17 |
| Apple Panic (C/D) | $20 |
| Genetic Drift (C/D) | $20 |
| Oper. Whirlwind (D) | $27 |
| Choplifter (D) $23 (R) | $29 |
| Match Boxes (C/D) | $20 |

### CDY CONSULTING

| | |
|---|---|
| Pogoman (C/D) | $27 |

### CBS

| | |
|---|---|
| Mountain King (R) | $27 |
| Boulders & Bombs (R) | $27 |
| Krazy (each) (R) | $27 |

### CONTINENTAL

| | |
|---|---|
| Home Accountant (D) | $48 |
| Tax Advantage (D) | $45 |

### COUNTERPOINT SW Call

### DATASOFT

| | |
|---|---|
| Pooyan (C/D) | $20 |
| Teletalk (D) | $33 |
| Graphic Master (D) | $23 |
| Micropainter (D) | $23 |
| Zaxxon (C/D) | $27 |
| Pac. Coast Hwy (C/D) | $20 |
| Clowns/Balloons (C/D) | $20 |
| Spell Wizard (D) | $34 |
| Canyon Climber (C/D) | $20 |

### EASTERN HOUSE

| | |
|---|---|
| Monkey Wrench II | $51 |

### EDUCATIONAL SW

| | |
|---|---|
| Tricky 1,2,3 or 4 | $15 |
| Tricky 5-13 | $22 |

### EDU-WARE

| | |
|---|---|
| Spelling Bee (D) | $27 |
| Compu/Read (D) $21 (C) | $15 |
| Compu/Math-FR (D) $27 (C) | $21 |
| Compu/Math-Dec (D) $27 (C) | $21 |

### EPYX

| | |
|---|---|
| Dragon Riders (C/D) | $27 |
| Temple APS (C/D) | $27 |
| Jumpman (C/D) | $27 |

### FIRST STAR

| | |
|---|---|
| Boulder Dsh (C/D) 20 (R) | 27 |
| Bristles (C/D) | $20 |
| Flip Flop (C/D) | $20 |

### GAMESTAR

| | |
|---|---|
| Football (C/D) | $21 |
| Baseball (C/D) | $21 |

# Printers/Etc.

### DIABLO

| | |
|---|---|
| 630 Letter Qual. | $1559 |

### SILVER REED

| | |
|---|---|
| EXP 400 Ltr. Qual. | $288 |
| EXP 500 Ltr. Qual. | $355 |
| EXP 550 Ltr. Qual. | $419 |
| EXP 770 Ltr. Qual. | $849 |

### STAR

| | |
|---|---|
| Gemini 10X | $259 |
| Gemini 15X | $378 |
| Delta 10 | $378 |
| Delta 15 | $519 |
| Radix 10 | $549 |
| Radix 15 | $645 |
| Power Type | Call |

### TOSHIBA

| | |
|---|---|
| 1340 | $739 |
| 1351 | $1249 |

### NEC

| | |
|---|---|
| 3510 | $1215 |
| 3530 | $1215 |
| 3550 | $1498 |
| 7710/7730 | $1648 |

### CITOH

| | |
|---|---|
| Prowriter | $315 |
| Prowriter II | $498 |
| Starwriter | $909 |
| Printmaster | $1189 |

### OKIDATA

| | |
|---|---|
| 82A | Call |
| 84P | 799 |
| 92 | $409 |
| 93 | $639 |

### DAISYWRITER

| | |
|---|---|
| 2000 | $985 |

### MANNESMANN

| | |
|---|---|
| 160L | $559 |
| Spirit | $299 |

### JUKI

| | |
|---|---|
| 6100 | $409 |

### ABATI

| | |
|---|---|
| LQ 20P Ltr. Qual. | $378 |

### PANASONIC

| | |
|---|---|
| 1090 | $255 |
| 1091 | $309 |
| 1092 | $458 |

## MONITORS

### AMDEK

| | |
|---|---|
| V300 G | $119 |
| V300 A | $139 |
| V310 G (IBM) | $155 |
| V310 A (IBM) | $159 |
| Color I+ | $269 |
| Color II+ | $399 |
| Color III | $349 |
| Color IV (IBM) | $699 |

### PRINCETON GRAPHICS

| | |
|---|---|
| MAX 12 (Amber) | $178 |
| HX 12 (RGB) | $449 |
| SR 12 (RGB) | $595 |

### SUPER 5

| | |
|---|---|
| 100A (Amber) | $99 |
| 500G (IBM with tilt) | $126 |
| 500A (IBM with tilt) | $126 |

### SAKATA

| | |
|---|---|
| SC100 (Color) | $239 |
| 1000G (Green) | $99 |

### TAXAN

| | |
|---|---|
| 100 Green | $115 |
| 105 Amber | $125 |
| 210 RGB/Composite | $269 |
| 400 RGB Med-Res. | $296 |
| 415 RGB Hi-Res. | $429 |
| 420 RGB Hi-Res.(IBM) | $479 |

### NEC

| | |
|---|---|
| JB 1260 (Grn) | $99 |
| JB 1201 (Grn) | $145 |
| JB 1205 (Amber) | $145 |

### ZENITH

| | |
|---|---|
| Green | $85 |
| Amber | $95 |

## MODEMS

### NOVATION

| | |
|---|---|
| J-Cat | $99 |
| Apple Cat II | $259 |
| D-Cat | $149 |

### HAYES

| | |
|---|---|
| Smartmodem | $199 |
| Smartmodem 1200 | $479 |
| Micromodem II | $259 |
| Micromodem IIe | $225 |

### PROMETHIUS

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|---|---|
| Promodem 1200 | $349 |

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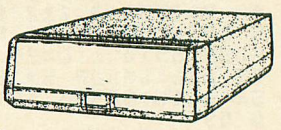

## INDUS GT . . . . . $309

## ATARI SOFTWARE

### MISCELLANEOUS

| | |
|---|---|
| Financial Wizard (D) | $41 |
| Castle Wolfenstein (D) | $20 |
| Master Type (D) | $27 |
| Astro Chase (D) | $22 |
| Miner 2049er (R) | $34 |
| Megalegs (C) | $23 |
| Cap'n Cosmo (D) | $19 |
| Spy's Demise (D) | $14 |
| Galac. Chase (D)$20 (C)$18 | |
| Kid Grid (C/D) | $20 |
| Battle Trek (D) | $20 |
| Air Strike (C/D) | $27 |
| T&F-PMP Property Management (D) | $149 |

### GEBELLI

| | |
|---|---|
| Firebird (R) | $27 |
| Embargo (R) | $30 |
| Candy Factory (D) | $20 |
| Match Racers (C/D) | $20 |
| Dr. Goodcode (D) | $20 |

### HAYDEN

| | |
|---|---|
| Go (D) $23 (C) | $20 |
| Sargon II (D) $23 (C) | $20 |

### HES

| | |
|---|---|
| Coco (C/D) | $34 |
| Coco II (C/D) | $27 |

### INHOME

| | |
|---|---|
| Baseball (R) $23 (D) | $23 |
| Crypts of Terror (D) $23 (C) | $20 |

### INNOVATIVE DESIGN

| | |
|---|---|
| Speedway Blast (D) $20 (R) | $27 |
| Pool 400 (R) | $27 |

### JV SOFTWARE

| | |
|---|---|
| Jrny to Plnts (C/D) | $20 |
| Action Quest (C/D) | $20 |
| Ghost Encount. (C/D) | $20 |

### INFOCOM

| | |
|---|---|
| Zork I, II or III (D) | $27 |
| Deadline (D) | $34 |
| Starcross (D) | $27 |
| Suspended (D) | $34 |
| Witness (D) | $34 |
| Planetfall (D) | $34 |
| Enchanter (D) | $34 |
| Infidel (D) | $34 |

### KRELL SAT Call

### INTELL. STATEMENTS

| | |
|---|---|
| Prof. Blackjack (D) | $46 |

### LJK

| | |
|---|---|
| Letter Perfect (D) | $74 |
| Data Perfect (D) | $74 |
| Spell Perfect (D) | $56 |
| Letter Perfect (R) | $74 |

### MICROPROSE

| | |
|---|---|
| Solo Flight (D) | $26 |
| Hellcat Ace (C/D) | $23 |

### MONARCH

| | |
|---|---|
| ABC Compiler (D) | $55 |

### OPTIMIZED SYSTEMS

| | |
|---|---|
| Action (R) | $65 |
| Basic XL (R) | $65 |
| Mac 65 (D) | $58 |
| C-65 (D) | $58 |
| Bug 65 (D) | $23 |

### ODESTA

| | |
|---|---|
| Chess (D) | $45 |
| Checkers (D) | $34 |
| Odin (D) | $34 |

### PARKER BROS

| | |
|---|---|
| Astrochase (R) | $33 |
| Death Star (R) | $33 |
| Q-Bert (R) | $33 |
| Popeye (R) | $33 |

### PHOENIX

| | |
|---|---|
| Birth of Phoenix (D) | $16 |
| Adv. In Time (D) | $20 |

### QUALITY

| | |
|---|---|
| Name That Song (D) $13 (C) | $11 |
| Return of Hercules (D) | $22 |
| Ali Baba (D) | $22 |
| Jeeper Creepers (D) | $20 |

### ROKLAN

| | |
|---|---|
| Gorf (D) $27 (R) | $30 |
| Dlx Invaders (D)$23 (R)$27 | |

### RESTON

| | |
|---|---|
| Moviemaker (D) | $45 |

### SCARBOROUGH SYS.

| | |
|---|---|
| Mastertype (D/R) | $27 |
| Songwriter (D) | $27 |

### SCHOOL WIZWARE Call

### SENTIENT

| | |
|---|---|
| Gold Rush (D) | $23 |
| Cyborg (D) | $23 |

### SIERRA ON-LINE

| | |
|---|---|
| Mission Asteroids (D) | $17 |
| Ulys.& Gldn Fleece (D) | $27 |
| Crossfire (D) $20 (R) | $23 |
| Mouseattack (D) | $23 |
| Jawbreaker (D) $20 (R) | $23 |
| Threshold (D) | $27 |
| Homeword (D) | $46 |
| Ultima II (D) | $39 |
| Dark Crystal (D) | $26 |
| Wiz. & Princess (D) | $22 |
| Lunar Leeper (D) | $20 |
| Wiz & Princess (D) | $22 |
| Frogger (C/D) | $23 |

### SIRIUS

| | |
|---|---|
| Bandits (D) | $23 |
| Space Eggs (D) | $20 |
| Sneakers (D) | $20 |
| Way Out (D) | $27 |
| Type Attack (D) | $27 |
| Repton (D) | $27 |
| Critical Mass (D) | $27 |
| Fast Eddy (R) | $23 |

### SPINNAKER

| | |
|---|---|
| Snooper Troop 1,2 (D) | $30 |
| Most Amazing (D) | $27 |
| Kids on Keys (D) | $20 |
| Trains (D) | $27 |
| Delta Drawing (R) | $27 |
| Aerobics (D) | $34 |
| Hey Diddle Diddle (D) | $20 |
| Srch Amzng Thngs (D) | $27 |
| Story Machine (D) | $23 |
| Face Maker (D) | $23 |

### STRATEGIC SIM.

| | |
|---|---|
| Broadsides (D) | $27 |
| Carrier Force (D) | $39 |
| Combat Leader (D) | $27 |
| Rails West (D) | $27 |
| Epidemic (D) | $23 |
| Eagles (D) | $27 |
| Cosmic Bal I or II (D) | $27 |

### SUBLOGIC

| | |
|---|---|
| Flight Simulator II (D) | $36 |
| Pinball (C/D) | $20 |

### SWIFTY

| | |
|---|---|
| J. White Music Lessons (C/D) | $20 |

### SYNAPSE

| | |
|---|---|
| File Manager (R) | $54 |
| Fort Apocalypse (C/D) | $23 |
| Dimension X (C/D) | $23 |
| Blue Max (C/D) | $23 |
| Encounter (D/R) | $23 |
| Zepplin (C/D) | $23 |
| Pharoah's Curse (C/D) | $23 |
| Protector II (D) $23 (R) | $29 |
| Shamus (D) $23 (R) | $29 |
| Fort Apocalypse (C/D) | $23 |
| Shamus II (C/D) | $23 |
| Necromancer (C/D) | $23 |
| Pharoh's Curse (C/D) | $23 |
| Drelbs (C/D) | $23 |
| Shadow World (C/D) | $23 |
| Survivor (C/D) | $23 |

### THORN EMI

| | |
|---|---|
| Soccer (R) | $34 |
| Jumbo Jet (R) | $34 |
| Submarine Comm. (R) | $34 |

### TRONIX

| | |
|---|---|
| S.A.M. (D) | $39 |
| P.M. Animator (D) | $29 |
| Juice (C/D) | $20 |
| Chatterbee (D) | $27 |

### USA

| | |
|---|---|
| 3-D Sprgrphcs (C/D) | $27 |
| Survival Adv. (C/D) | $17 |

CIRCLE #135 ON READER SERVICE CARD

```
520 TI=TI-W:GOSUB 740:A=10:POKE T1,A:A
=MZ-W:B=10:GOSUB 900:SC=SC+C
522 GOSUB 950:IF Z<SC THEN 522
525 A=PEEK(T1):IF Z<A THEN 525
530 GOTO 515
570 LV=LV-W:GOSUB 720:IF Z<LV THEN 200
572 GOTO 100
600 GOSUB 950:GOSUB 750:A=764:B=PEEK(A
):C=10:IF B=C THEN 600
615 A=PEEK(R):B=64:GOSUB 910:A=C:B=8:G
OSUB 900:A=E+C:A=A+C5:B=C5+G:C=8:C=C+A
620 A=PEEK(R):B=14:IF B<A THEN 620
622 B=4:GOSUB 900:A=C+B:B=92:B=B+C5:PO
KE B,A
630 A=PEEK(OP):B=6:IF A=B THEN 100
670 A=462:A=A+D5:B=PEEK(A):IF B=NL THE
N 680
672 NL=B:LV=LV+W:GOSUB 720
680 A=PEEK(T1):IF Z<A THEN 300
681 A=50:POKE T1,A:IF NP=W THEN 683
682 A=35:POKE T1,A
683 TI=TI-W:GOSUB 740:IF Z<TI THEN 300
685 GOTO 570
700 B=208:A=C5+B:B=24:B=B+A:C=D5:E=20
702 D=PEEK(A):POKE C,D:A=A+W:C=C+E:IF
A<B THEN 702
704 RETURN
710 A=N:B=10:GOSUB 910:E=C:A=E:B=10:GO
SUB 900:F=N-C
712 A=208:F=F+A:E=E+A:RETURN
720 A=10:IF LV<A THEN 725
722 LV=9
725 A=208:A=A+LV:B=240:B=B+D5:POKE B,A
:RETURN
730 N=MZ:GOSUB 710:A=320:A=A+D5:POKE A
,E:A=340:A=A+D5:POKE A,F:RETURN
740 N=TI:GOSUB 710:A=470:A=A+D5:POKE A
,E:A=A+W:POKE A,F:RETURN
750 A=53760:POKE A,Z:A=53761:POKE A,Z:
RETURN
800 A=D5:B=460:B=B+D5
801 POKE A,W:A=A+W:IF A<B THEN 801
805 B=12:C=65:D=18:E=20:F=1
806 A=2:A=A+E:A=A+D5:G=A+D
807 POKE A,C:A=A+W:A=A+W:IF A<G THEN 8
07
808 F=F+W:I=40:E=E+I:IF F<B THEN 806
810 K=Z:E=230:E=E+D5:POKE E,Z:GOSUB 87
0
820 A=PEEK(R):B=220:IF B<A THEN 820
822 B=A+A:E=B+D5:A=PEEK(E):B=129:IF A=
B THEN 830
824 GOTO 820
830 M=E
832 A=PEEK(R):B=64:GOSUB 910:F=C+W
834 G=M:E=M:GOSUB 890:A=PEEK(E):IF E<D
5 THEN 832
835 B=440:B=B+D5:IF B<E THEN 832
836 A=PEEK(E):IF A=Z THEN 840
838 GOTO 832
840 POKE M,Z:POKE G,Z:B=K+K:A=53760:PO
KE A,B:A=53761:B=132:POKE A,B
850 E=M:GOSUB 870:K=K+W:A=98:IF K<A TH
EN 820
852 AI=Z:P1=222:P2=238:A=P1+D5:POKE A,
MP:A=P2+D5:POKE A,Z:IF NP=W THEN 855
853 POKE A,MP
855 A=SP:B=5:GOSUB 910:A=230:A=A+D5:B=
208:B=B+C:POKE A,B
869 RETURN
870 F=W:N=E
872 E=N:GOSUB 890:A=PEEK(E):IF E<D5 TH
EN 875
873 B=440:B=B+D5:IF B<E THEN 875
874 B=65:IF A=B THEN 879
875 F=F+W:B=5:IF F<B THEN 872
876 RETURN
879 B=129:POKE E,B:GOTO 875
890 C=20:B=40:P=2:IF F=W THEN 895
891 A=2:IF F=A THEN 896
892 A=3:IF F=A THEN 897
894 I=I-W:G=G-C:E=E-B:RETURN
895 J=J+W:G=G+W:E=E+P:RETURN
896 I=I+W:G=G+C:E=E+B:RETURN
897 J=J-W:G=G-W:E=E-P:RETURN
900 C=Z:D=Z:IF B=Z THEN 904
902 C=C+A:D=D+W:IF D<B THEN 902
```


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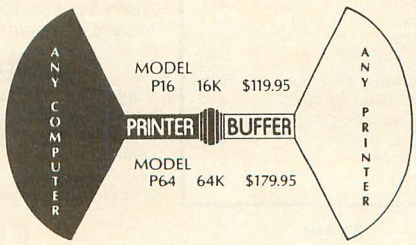


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CIRCLE #136 ON READER SERVICE CARD

```
904 RETURN
910 C=Z:IF A<B THEN 914
912 A=A-B:C=C+W:IF B<A THEN 912
913 IF A=B THEN 912
914 RETURN
950 IF SC<W THEN 959
952 SC=SC-W:C=466:C=C+DS:G=80:D=90
954 B=PEEK(C):B=B+W:IF B<D THEN 957
955 B=G:POKE C,B:C=C-W:GOTO 954
957 POKE C,B
959 RETURN
999 END
9500 REM CHR SET
9502 CS=11776:FOR I=57344 TO 57850:POK
E CS,PEEK(I):CS=CS+1:NEXT I:CS=11776
9510 RESTORE 9511:FOR I=0 TO 95:READ A
:POKE I+CS+8,A:NEXT I
9511 DATA 251,223,254,247,253,127,239,
191
9512 DATA 24,60,70,199,126,60,99,99
9513 DATA 24,60,74,203,126,60,54,54
9514 DATA 24,60,82,211,126,60,102,102
9515 DATA 24,60,98,227,126,60,198,198
9516 DATA 0,24,60,153,126,24,126,195
9517 DATA 24,60,152,126,27,56,236,6
9518 DATA 24,61,25,126,152,60,102,195
9519 DATA 24,60,24,126,153,60,103,192
9520 DATA 32,64,128,68,58,1,2,4
9521 DATA 0,0,0,0,0,0,0,0
9522 DATA 251,223,254,247,253,127,239,
191
9530 REM MESSAGES
9532 RESTORE 9534:FOR I=0 TO 24:READ A
:POKE I+CS+208,A:NEXT I
9534 DATA 225,238,228,242,239,244,239,
238,0,0,0,172,208,0,0,173,208,208,0,0,
164,170,162,0,0,0
```

## CHECKSUM DATA.

*(see page 20)*

```
10 DATA 63,726,610,637,88,742,10,348,1
72,957,311,399,779,779,694,7315
130 DATA 606,280,170,875,197,178,339,4
16,592,9,344,501,15,443,229,5194
198 DATA 134,988,629,236,388,105,191,2
42,433,729,108,431,252,445,741,6052
285 DATA 176,612,898,125,74,463,8,551,
375,399,205,605,569,380,224,5664
333 DATA 572,383,961,281,626,575,386,6
19,420,644,517,216,632,726,473,8031
358 DATA 358,603,737,324,233,624,782,2
70,217,122,128,133,285,621,900,6337
401 DATA 572,829,251,591,57,601,66,706
,286,282,792,807,103,791,800,7534
417 DATA 113,110,734,437,450,435,460,1
04,601,240,229,550,734,11,279,5487
470 DATA 158,127,510,614,254,545,277,8
85,139,622,470,625,950,922,716,7814
570 DATA 103,714,526,839,360,503,410,5
92,592,922,415,360,117,751,873,8077
702 DATA 214,597,517,707,375,136,109,3
12,379,893,808,452,350,344,178,6371
808 DATA 644,245,214,105,727,272,605,2
61,895,632,739,543,498,537,58,6975
855 DATA 76,622,570,631,922,180,581,62
2,607,242,846,852,847,869,831,9298
897 DATA 889,709,17,601,884,5,575,604,
661,645,373,312,742,621,78,7716
9500 DATA 712,202,354,374,856,798,215,
293,995,815,226,224,623,949,377,8013
9530 DATA 364,843,548,1755
```


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| Atari Microsoft II (D & R) | $69 |
| Atari Music (D) | $30 |
| AtariWriter (R) | $75 |
| Eastern Front (R) | $35 |
| Joust (R) | $37 |
| Mario Brothers (R) | $37 |
| Pilot (R) | $69 |
| Pole Position (R) | $37 |
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| K-dos (D) | $15 |
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|---|---|
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CIRCLE #137 ON READER SERVICE CARD

IT'S HERE

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A special PLUG 'N PRINT™ package lets you plug your new OKIMATE 10 into your Atari or Commodore computer. And print. It's that easy. In minutes you'll be printing everything from soufflé recipes to needlepoint patterns. Party invitations to kitchen inventory. Love letters to gardening directions. At 240 remarkable words per minute. And not just in black and white, but in over 26 brilliant colors!

**Financial statements will keep you tickled pink for very little green.**

If you use your personal computer to keep track of mortgage payments, tuition payments, balance your checkbook or jump ahead of the Dow Jones', there's good news for you. You'll find that the new OKIMATE 10 gets down to business quickly. And easily.

A "Learn-to-Print" diskette and tape shows you how to set up your new personal color printer and start printing. A complete OKIMATE 10 Handbook will show you how you can take your imagination to places it's never been before.

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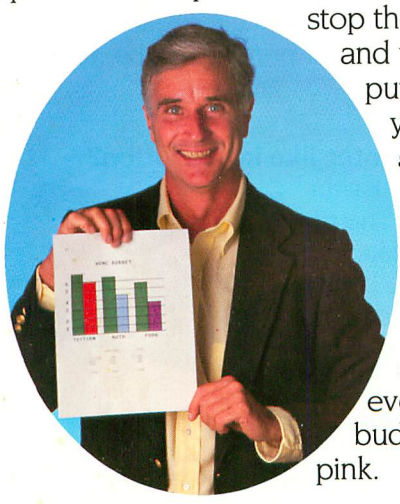
# OR

## PERSONAL COLOR PRINTER UNDER $250.

And while your imagination is soaring, you'll be glad to know that your new printer can keep right up with it! The new OKIMATE 10 is built with the same tradition of quality and manufacturing excellence that has made Okidata the most respected name in computer printers. Okidata craftsmen specially designed and engineered the new OKIMATE 10 to be incredibly small and lightweight. And they made it quiet as a whisper. But their imagination didn't stop there. To help you and your personal computer keep within your personal budget, they made the OKIMATE 10 available at retailers everywhere for less than $250. Something that should make every personal budget tickled pink.



**Color your world.**

If you've been playing games on your personal computer, now you can get serious and still have fun. The new OKIMATE 10 is completely compatible with a variety of software packages that will run on your Atari and Commodore with a simple disk drive. Just load and you're off and running. Plotting charts. Designing special graphs. Creating original illustrations and pictures. Drawing special graphics. And printing them all beautifully for everyone. On most kinds of paper. In over 26 beautiful colors!

# QUESTIONS & ANSWERS

**Q: Why do I need a printer?**

**A:** You might as well ask, "Why do I need crayons?" When it comes to communicating, "putting it on paper" is still the best way to get your message across. You can have lots of computer equipment, but without the OKIMATE 10, it doesn't mean very much. Unless you get your letter, report, term paper or party invitation off the screen and down on paper, nobody's going to see it.

**Q: What makes the OKIMATE 10 better than any other printer?**

**A:** Because the OKIMATE 10 is unlike any other printer. First, it prints in COLOR. Up to 26 beautiful colors. Second, it prints up to 240 words a minute, so quietly you can talk in a whisper right next to it and still hear every word! And third, it prints letter quality, every time.

**Q: What about graphics and pictures?**

**A:** The OKIMATE 10 does it all. Graphs, charts, symbols, pictures, illustrations, and special drawings! With a compatible drawing package, anything you create on your screen can be printed in full color; a disk drive is required for color screen printing.

**Q: What kind of paper can I use?**

**A:** Just about any kind of smooth paper you want. From continuous feed computer paper to single sheets. From mailing labels to plastic acetate for overhead transparencies, the OKIMATE 10 prints crisp, clean, colorful images you'll be proud to send to friends, teachers, business associates, or frame and hang right in your own living room!

**Q: Is the OKIMATE 10 easy to use?**

**A:** As easy as "PLUG 'N PRINT!" No other printer is easier to use than the OKIMATE 10. Connecting the printer to your Commodore or Atari computer is, literally, a snap. The exclusive PLUG 'N PRINT package snaps into the printer. One cable connects it directly to your computer or disk/tape drive. Turn it on and you're in business. Once your OKIMATE 10 is up and running, the "Learn-to-Print" software program (included) teaches you printer basics—the "Color Screen Print" disk (also included) automatically prints everything on the screen in a single stroke. As a matter of fact, most of your printing can be done with just one command.

**Q: What's the printer like in operation?**

**A:** In one word: easy! Incredibly easy! The ribbon comes in a "Clean Hands" cartridge. So it's as easy to change as the tape in your audio cassette player.

**Q: What about reliability?**

**A:** Okidata has built the reputation of its complete line of printers on quality, dependability and rugged construction. The OKIMATE 10 is no exception. Don't let its light weight and compact size fool you. This printer is not a toy. It's a workhorse.

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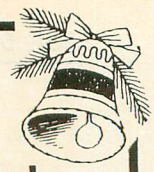

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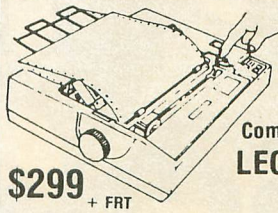

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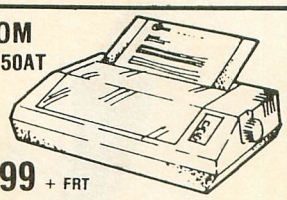

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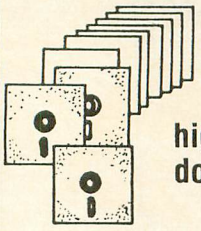

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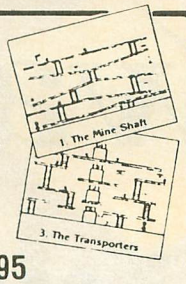


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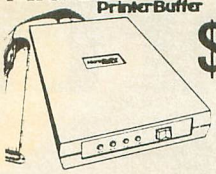

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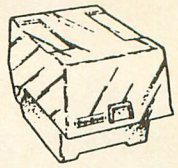

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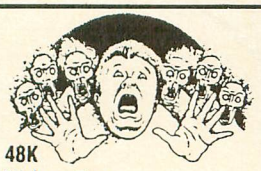

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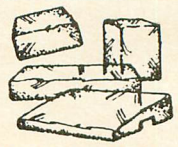

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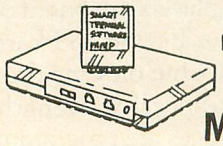


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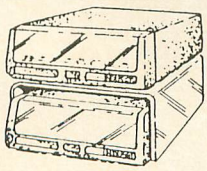

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# The Season's Software Sampler

by Steve Panak

The time is upon us. The yule season has arrived and blanketed us with good spirits, gifts and, depending on your current locale, tons of the white stuff. Alas, but the season has also trapped many of us indoors. Never fear; all you need is your trusty Atari and one of the new software products that are flooding the market in competition for your Christmas cash. In our first-reviewed game, we'll see that Electronic Arts again corners the market on creativity.

**ONE ON ONE**
**by Eric Hammond, Larry Bird and Julius Erving**
**ELECTRONIC ARTS**
**2755 Campus Drive**
**San Mateo, CA 94403**
**48K Disk $40.00**

Creating a videogame based on a major sport is one of the trickiest tasks imaginable. The main problem is that the marketplace has a nearly-insurmountable rift in it. Fans are irreconcilably at odds with non-fans, so finding common ground to appeal to both groups would be a miracle. Well, meet the miracle. Electronic Arts' **One on One** not only vaults the chasm, but also makes all other sport software seem shallow in comparison.

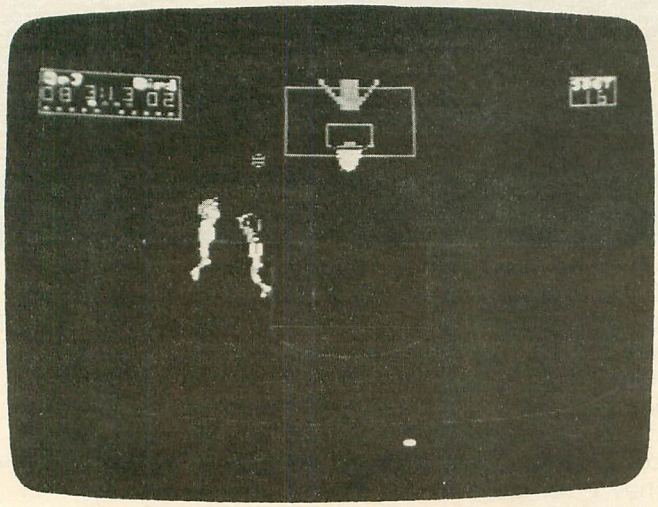
I am not a sports fan. The sports I do enjoy can be counted on one hand, and team sports—such as basketball—are not among these. Thus, I am a logical candidate to appraise the game's appeal to a non-sportsman. In my case, **One on One** had to be more than good. . . it had to be entertaining, have real-life complexity and, finally, overcome all the prejudices against sports I've acquired over the years. And it succeeds. Even if you despise the game of basketball, you have to admire the program for its depth and sophistication.

The players are based on real-life (so I am told) players Julius Erving and Larry Bird. According to my fan friends, **One on One** does closely duplicate these two men's respective strengths and weaknesses. Shooting percentages are programmed for both players, and each has his own style of play. Dr. J, for example, is best at driving to the basket, while Bird is better from the outside and at rebounding. But the game goes deeper still.

Nearly every human strength and weakness has been anticipated and provided for. Fatigue is built in. Bars at the bottom of the screen fluctuate to show how the players are holding up, and a rest will cost you a time-out. Hot streaks are also built in, but there are no indicators to tell you when this is happening—

according to Bird, "you have to feel it." In more advanced games, fouls are called, and, again, as in real life, the ref calls most of the fouls against you. But the graphics and their movement are what give **One on One** the competitive edge.

Gone are the block figures of early video basketball games. The images actually resemble players, to the extent possible given the memory and screen resolution constraints. They are easily distinguishable and, more importantly, move like real players. Spinning to the basket, slamming stunning dunks, fading back for long jump shots—all movements are fluid and child's play for the new armchair star.



One on One.

Thanks to careful program structure, rather than holding an impotent joystick, you are actually the player. Back and forth, right and left are controlled by the stick, while the button does everything else. Depending on where you are and whether offense or defense, a push of the button will spin you around, shoot, steal, rebound or block. Never have I seen full control combined with true simplicity like this. But we mustn't forget that basketball is a spectator sport.

Remarkably, **One on One** is as much fun to watch as it is to play. Programmer Eric Hammond has accomplished this miracle by inserting a few special features. Not only are there stunning plays as outlined above, but—just like TV—you'll never miss the good plays. If the computer notices a spectacular shot, it will rerun it with slow motion instant replay. A super slam dunk will shatter the backboard, forcing the court janitor to clean up your mess. When fouls are called, a ref strolls out to humiliate and irritate you. Neither is sound forgotten. Present are the roar of the crowd, the swish of the net, the dribbling of the ball—nearly everything but technical foul expletives (it's up to you to supply those).

If you should somehow find yourself without a human opponent, the computer will happily defeat you —with either player. And, if you find yourself improving, four levels of play are available to test your skill. The trait of all great software, versatility, is truly present here. You can play a timed game or to a set point score; "Winner's or Loser's out" controls who gets the ball after a score; and you can play the whole game in slow motion if you wish.

The 24-second shot clock speeds up play, and, in the Pro level, the 3-point line makes that outside shot especially attractive. All this is carefully explained in full documentation, with helpful hints and strategies garnered from the design sessions between Hammond, Bird and Erving—all contained in the now-familiar Electronic Arts package. But all this has been from a person who can't stand basketball; what do the fans say?

They say that **One on One** is a great game...maybe the best. I have had no complaints from numerous playtesters, the ones who usually grumble and groan about the games I have them play. **One on One** seems to please just about everyone. A game that is nearly as much fun to watch as it is to play, **One on One** is truly in a league by itself.

**SUMMER GAMES**
**by Randy Glover, Stephen Landrum, Jon Leupp, Brian McGhie, Stephen Mudry, Erin Murphy and Scott Nelson**
**EPYX**
**1043 Kiel Court**
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**48K Disk $39.95**

It's been months since the '84 Olympics, and by now people's minds have been programmed into forgetfulness. Fortunately, **Summer Games** has appeared on the horizon as a software souvenir of the supreme sporting event. But the Olympics have been so commercially exploited this year that the thought of someone else trying to make a quick, parasitic buck (even at this late date) really revolts me. So, needless to say, **Summer Games** had better be good.

**Summer Games** sets a lofty goal for itself, attempting to recreate the spirit of the games themselves, from opening ceremonies to closing. **Summer Games** is an extremely complex game, and this complexity surely challenged the programmers and pushed them, like Olympic athletes, to their limits.

After the opening ceremonies, complete with the lighting of the flame and releasing of the doves, the players compete in eight events: pole vault, 4x400-meter relay, 100-meter dash, gymnastics, freestyle relay, 100-meter freestyle and skeet shooting. The contestants sign in and pick their country. All of this is done smoothly, and up to eight players may choose from up to eighteen countries. Other options allow you to compete in only one event, to practice one event, to display the current records (which are stored

*(continued on page 53)*

# THE MMG BASIC COMPILER

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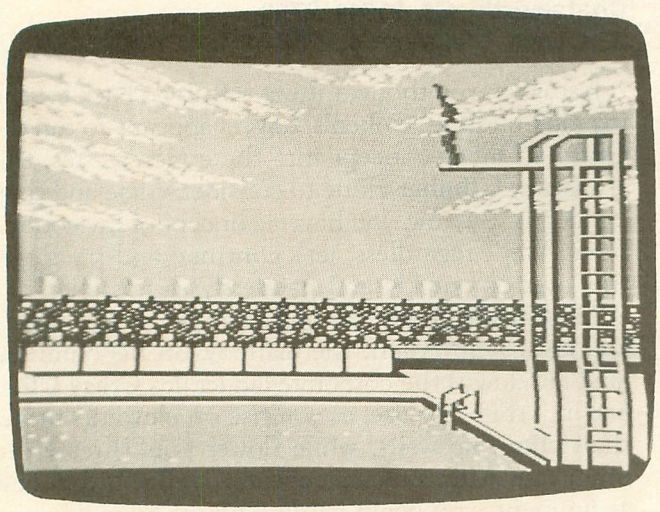
to disk) or to rewatch the opening ceremony. So no problem with versatility here.

However, a problem does develop during play and rears its ugly head in the form of a nearly-endless series of disk swaps. The program resides on both sides of a double-sided disk, and seven swaps are necessary to complete the games. I found this annoying—often swaps were made just to view the event result screen and hear the gold medal winner's national anthem.



Summer Games.

The control of the athletes is complex and does approximate real life. Most events demand good timing and excellent eye-hand coordination. For example, the pole vault requires you to choose the jump height and pole grip, then press the fire button to begin the run. Pulling back on the stick plants the pole; pushing forward simulates the kick up over the bar; and, finally, another press on the button releases the pole. Only with precise timing will you clear the bar. While some events are this complex, others—like swimming or running—depend on correctly timing the press of the button or on how fast you can move the stick back and forth. Converting diving and gymnastics, very artistic sports, to video form is a task I would have thought impossible, but the conversion has been done well. Most events require practice to perfect and obtain record scores.

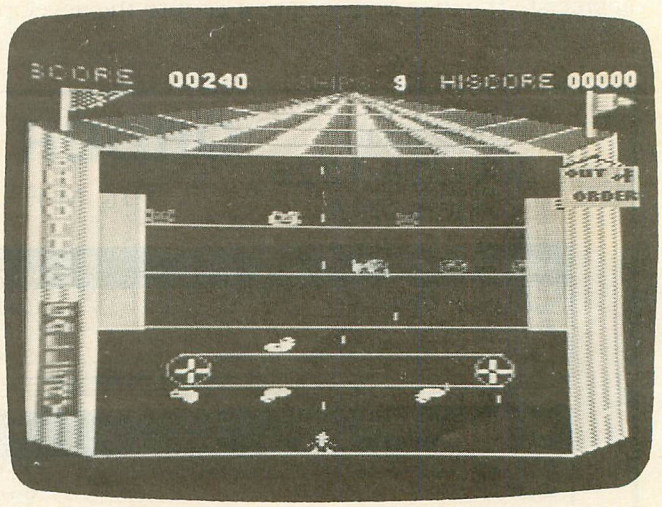
Documentation is excellent; each event is described, and hints are given as to how to excel. Graphics are superb. The screens for each event are finely detailed, and the athletes movements are fairly true to life.

The biggest flaw in **Summer Games** is the complexity and grandiose scope of the game. I tired of the various contests before even mastering them. Continuously having to sit through award ceremonies didn't help to win me over, either. Still, it's entertaining and makes a good party game. Regrettably, only one joystick is used and, thus, must be constantly passed around. Although head-to-head competition is never realized (all play is one-at-a-time, against the clock), the competition *does* get intense. I can heartily recommend **Summer Games** to the diehard Olympic fan. But, if the real Olympics bore you, you'd probably do well to look before you leap into **Summer Games**.

**THE ARCADE MACHINE**
**by Chris Jochumson, Doug Carlston and Louis Ewens**
**BRODERBUND SOFTWARE, INC.**
**17 Paul Drive**
**San Rafael, CA 94903**
**48K Disk $59.95**

Is it a game? Is it a utility? It's two, two, two programs in one. . . If you've ever been ravaged by the desire to create your own arcade action game (and do the professionals one better), then **The Arcade Machine** is for you.

**The Arcade Machine** resides on a double-sided disk. The first side contains a program which allows you to build, modify and perfect an arcade game. The second side contains four sample games made with the **Machine**. These show you the power of this program, as well as giving you basic designs to modify.




The Arcade Machine.

**The Arcade Machine** is not for the weak of stomach, nor for the weak of mind. *Complexity* is a key word here. However, despite its complexity, the program is surprisingly user-friendly, thanks to excellent documentation. Sophisticated programs *require* extensive instruction manuals. How would you feel if you bought word processing software and received with it a 4-page, condensed scrap of instruction material? Fortunately, **The Arcade Machine** doesn't let you down. It comes with an 86-page booklet whose first chapter includes a section headed "How to use this manual."

Basically, you create your game by designing shapes (the enemy), explosions and tanks (you). Shapes can

be animated or mutated; they can told where, when and how far to move; and you can tell them when to drop bombs on you. Your options are limited only by one essential constraint: fundamental theme. You create the perfect game in the genre of "the enemies lob bombs at you, while you try to kill them"—survival of the fittest.

The program and manual walk you through the creation of your game. The **Machine** is divided into a number of separate and independent programs, which allow you to create shapes, their paths, game options, level options, background, title pages and sound effects—and then lets you save these to disk. The number of possibilities is astronomical, far too many to mention here—you'll just have to look it over on your own. The result is similar to a word processing program. You can easily refine and edit your creation till it's perfect. Once finished, you'll have a self-booting disk copy of your game which can be used independently of **The Arcade Machine**.

But. . .the process takes time, and this is the real drawback to **The Arcade Machine**. Many, many, *many* hours are needed to create and hone your game to perfection—and that's if you're not a perfectionist. If anything, **The Arcade Machine** will force you to appreciate the time and work that go into the development of a great game. And you have it *easy*; most of the hard stuff is done for you. Still, if you've got the time, Broderbund has the disk. **The Arcade Machine** is the perfect utility for the aspiring game designer.

### COHEN'S TOWERS
**by Frank Cohen**
**DATAMOST**
**8943 Fullbright Avenue**
**Chatsworth, CA 91311-2750**
**32K Disk $34.95**

Just when you thought it was safe to go back to scaling tall buildings, **Cohen's Towers** appears, to run the **Crazy Climber** concept into the concrete. Yes, this is a **Crazy Climber** clone to consider, curse and then condemn. By now, you have a concept of my conclusions. Well, regardless, let's continue and try to get this over as quickly and painlessly as possible.

That's right, high rise buildings are unsafe again. You must help Allen, the mailboy, on his climb up (and fall down) the corporate ladder. It's **Crazy Climber** in a thin disguise, as you rise on elevators rather than climb up walls, while flower pots threaten to brain you. After a memo appears to tell you your new assignment, you begin gaining points by picking up

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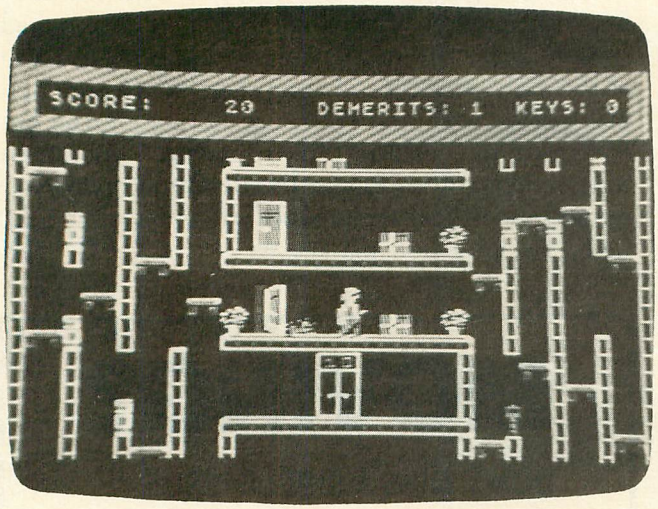
packages and dropping them off in the mailboxes scattered throughout the levels. But, as usual, there are difficulties.




Cohen's Towers.

Hindering your progress is Killer, the boss' dog. His touch is deadly (must have forgotten the rabies shots for old Killer). The corporate spy will steal your packages from you (it's a jungle out there). And, finally, the secretary will let you kiss her for extra points. I guess that's your fringe benefit.

Actually, the greatest benefit you could give yourself would be not to play this game. And don't even *consider* buying it. **Cohen's Towers** gives big business a bad name, and all its copies should be piled up and turned into a towering inferno.

**COSMIC TUNNELS**
**by Tim Ferris**
**DATAMOST**
**8943 Fullbright Avenue**
**Chatsworth, CA 91311-2750**
**32K Disk $34.95**

The front of the manual for **Cosmic Tunnels** is proudly emblazoned with the announcement, "Captain Sticky Returns." Maybe I'm in the dark: not only did I not know that he had left, but I haven't the faintest idea who he is. For argument's sake, I can accept the fact that he exists. What I can't accept is **Cosmic Tunnels**. It's yet another of the arcade ripoffs flooding the software marketplace.

The basis of **Cosmic Tunnels** seems to be a hodgepodge of **Gorf** and **Gravitar** (both of which, unfortunately for **Cosmic Tunnels**, are among my favorites). You move through four screens on your way through this dog.

On the first screen, you take off toward one of the tunnels, avoiding contact with your base or falling meteors. Once you reach a **Cosmic Tunnel**, you are whipped into screen two. This phase is a 25-second space warp. You score points by shooting space mines and stay alive by avoiding them. In phase three, you attempt to land on the asteroid. This part is nearly identical to **Gravitar**, as you try to land with enemy bases shooting at you. Hits don't kill instantly, but merely rob you of valuable power. The object here is to destroy everything and land safely.

Once landed, you exit to collect glowing bars and return them to the ship, one at a time. Thwarting you here are Dynobots, Electric Lizards, Monstrous Munchers and wild Space Turkeys. I can deal with the lizards and munchers, but *wild Space Turkeys?* If you complete your mission, you reverse your path back to screen one and, of course, do it all over again.

Cosmic Tunnels.

**Cosmic Tunnels** is further handicapped by packaging which I would not be caught dead holding. I found the entire game juvenile and insulting to anyone of above average intelligence. I cannot recommend this game to anyone who is not my enemy.

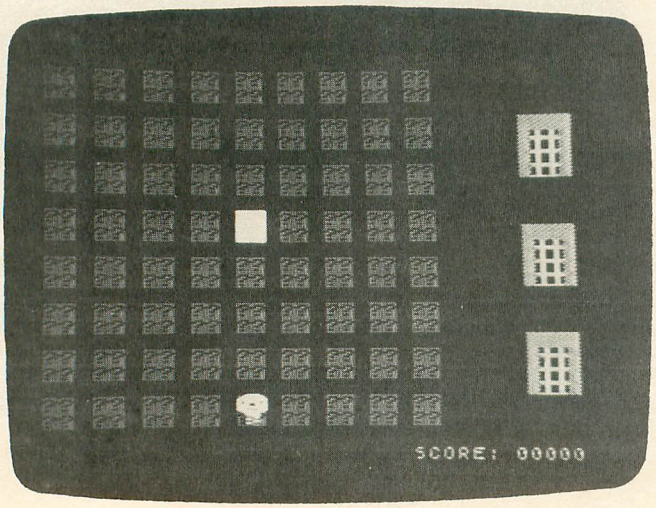
**PUZZLE PANIC**
**by Ken Uston, Bob Polin and Ron Carr**
**EPYX**
**1043 Kiel Court**
**Sunnyvale, CA 94089**
**32K Disk $35.00**

If you're the type who eternally complains that the software gods never bring out anything new, and all entertainment programs are just variations on a few simple themes, then **Puzzle Panic** may please you.

In fact, **Puzzle Panic** is so radically different, so unlike anything else you've ever set your cathode-ray-bloodshot eyes on, that there's no readily memorable program to compare it with. The closest items to it are the current bestsellers which require you to solve a puzzle to win a chance at a large prize. However, don't run out and spend your prize money all at once, because, even though the game is copyrighted 1984,

the contest ended August 31, 1984. You'll have to purchase **Puzzle Panic** solely on its merits.

These merits are cut and dried. **Puzzle Panic** is simply a series of puzzles. Some require luck, others skill; most take a combination of the two. There are eleven puzzles, each with from one to six levels—a total of forty-three problems in all. Basically, you maneuver your cursor, an icon-shaped light bulb named Benny, around the screen, touching the right things or going to the right places. For example, in the Card Sequence, you must identify which group of playing cards should contain a card that's moving across the screen. In Sound Chase, you memorize and repeat a series of sounds and movements. Probably the best way to start out is by playing the puzzles individually. But **Puzzle Panic** doesn't end with simple puzzles.




**Puzzle Panic.**

Once you've become familiar with all the different types of puzzles, you may be ready to move on to stage two—determining the correct order in which to solve the puzzles. At the end of each puzzle, Benny may enter any of a number of gates. If you choose the correct gate, Benny will smile and go on to the next puzzle. If you choose the wrong gate, he'll frown—and you'll remain on the same screen.

Your greatest challenge lies ahead. . . it is the Metasequence! The word itself implies the ultimate. If you successfully complete the entire series of puzzles, you're given a shot at this finale. Don't even *ask* me what it is. I, like most of you who have already challenged **Puzzle Panic**, never even got a glimpse of this ellusive epilogue. The only thing I know about it is what the manual says: every puzzle has a clue to solve the Metasequence. The manual gives you *just* enough information to nudge you in the right direction, providing a chart on the back to keep track of puzzles and their clues.

**Puzzle Panic** is addictive. Its most dangerous facet is the lack of any natural breaks in the action. When Benny loses a life, the loss to you is only in points (which you've earned in solving each puzzle). Thus, without an "ending" to stop your play (a score of less than zero won't do it), you can easily go on forever.

One thing can be said of **Puzzle Panic**. I think it may start a trend. With substantial prizes, and enough time to solve the puzzle (to give more of us a shot at the cash), this type of computer age treasure hunt may proliferate—and they may be among the best ideas to come our way. I like to see new types of entertainment software, and **Puzzle Panic** breaks new ground, inviting other producers to enter what could be an exciting new market. □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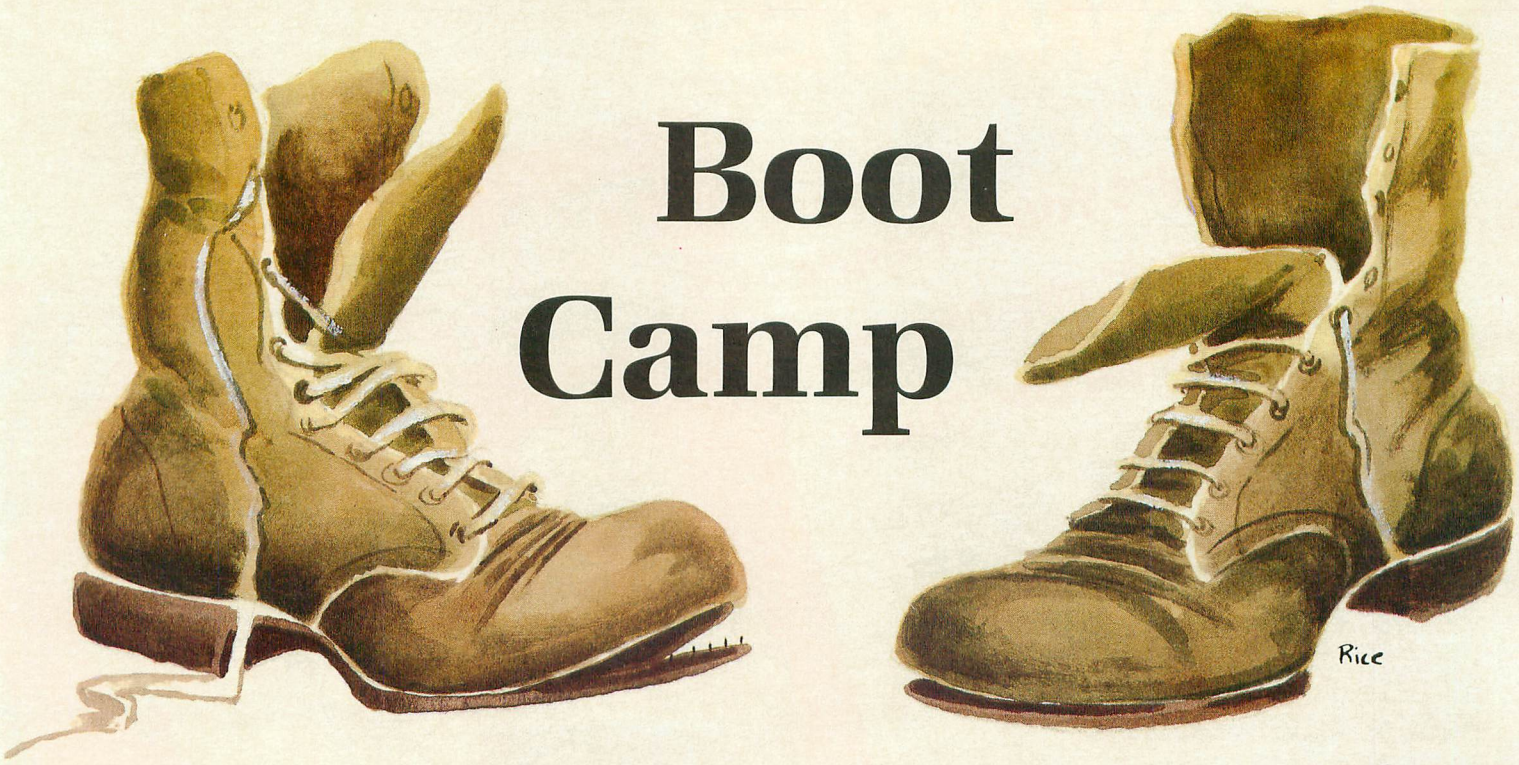


# Boot Camp

by Tom Hudson

Well, **Boot Camp** fans, here I am again, after a month's absence. I hope all **Boot Camp** readers typed in the **BOFFO** program from last issue—it'll be a big help to you in the future when building BASIC USR call structures.

Speaking of BASIC USR calls, that just happens to be the subject of this issue's column. We're going to take a couple of problems and solve them using assembly language, via the USR function.

### Using USR.

As we all know, interpreted BASIC is a very slow way to get things done in a computer. For an explanation of what happens in interpreted BASIC, take a look at issue 13's **Boot Camp**. We're going to look at a way to overcome this inherent sluggishness, using the USR (call user subroutine) function. The format of this function is:

```
USR( aexp1 [,aexp2] [,aexp3...] )
```

. . .where aexp1 is the address of the assembly code to be executed, and aexp2, aexp3, etc. are optional numeric arguments which are passed to the assembly routine..

The USR function simply tells BASIC to perform a JSR to the assembly code located at the address indicated by aexp1. Take a look at the following USR call:

```
A=USR(1536)
```

This USR call will execute the code at location 1536 ($0600) and return to BASIC, where the program will continue execution with the next statement. If the subroutine is to return a value to BASIC, it will be returned in the variable A. This USR call doesn't use any arguments.

Many times, you'll want your USR call to process some type of data or accept parameters of some sort. This is done by using the optional arguments. Look at this example:

```
A=USR(30926,102,Q*3)
```

This USR function calls the assembly code located at address 30926 ($78CE) and passes two values, 102 and the value of Q*3, to the subroutine. The arguments must be integers in the range 0-65535, and the assembly code must be equipped to handle the two parameters properly.

What happens to the parameters we send? BASIC places them on the 6502 stack for easy retrieval by the assembly code. For example, look at the following USR call:

```
A=USR(1536,509,200)
```

*(continued on page 59)*

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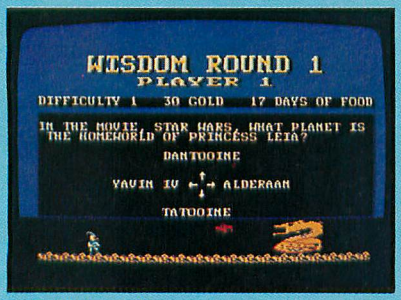


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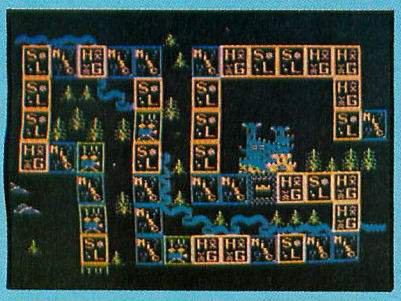

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This code calls the routine at 1536 ($0600) and passes two arguments, 509 and 200, to the subroutine. After the USR function is processed, and control is passed to the assembly code, the stack looks like Figure 1.

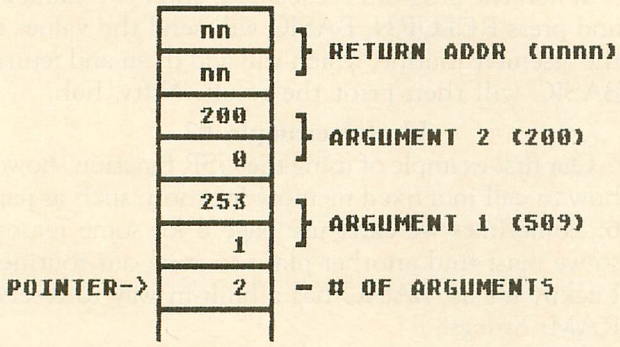


Figure 1.

Remember that the stack grows *downward* in memory, so the first number on the stack is the number of two-byte arguments placed on the stack by BASIC, or 2. This value is important for assembly code which may require a variable number of parameters, since the subroutine can tell how many parameters are available by this number.

The next item on the stack is the first parameter, 509. As you can see, the high byte of this value will be pulled off the stack first, followed by the low byte. All arguments are placed on the stack in high-byte, low-byte order.

Next in the stack is the second parameter, 200. Like the first argument, it is placed in high-byte (0), low-byte (200) order.

Finally, the stack contains the return address for the assembly subroutine. In this stack illustration, the address is shown as *nnnn*, since we don't know where BASIC will go when the assembly routine returns. This is simply an RTS return address, and—after processing the parameters, if any—the subroutine merely executes an RTS instruction to return to BASIC.

Remember how I said the assembly code could return a value to BASIC? If this is necessary, the assembly code should place the low byte of the value in location 212 ($D4) and the high byte in location 213 ($D5). BASIC automatically puts the value into the proper variable. The programmer must take care, however, that the result is in the range 0-65535.

### Useful example #1.

I've always said that there's no better way to learn something than hands-on experience, so let's write a simple program to add two arguments passed by a BASIC program.

We'll place the subroutine on page 6 (you could put it anywhere in free RAM) and call it with the following code:

```
A=USR(1536,VAL1,VAL2)
```

Now let's write the assembly code necessary for the routine. First, we must set up the program for binary arithmetic with the CLD instruction. I can't overemphasize how important it is to know the status of the decimal mode flag, especially in programs which perform mathematical operations. Our program looks like this:

```
0160          *=  $0600 ;PUT ON PAGE 6
0170          CLD       ;BINARY MATH!
```

Next, we use the PLA instruction to pull the first byte from the stack. As explained earlier, the first byte tells the routine how many arguments were passed to the routine. For simplicity, we'll assume the USR call was properly set up with two arguments, and ignore this value. Now our program looks like this:

```
0160          *=  $0600 ;PUT ON PAGE 6
0170          CLD       ;BINARY MATH!
0180          PLA       ;PULL # OF ARGS
```

The next step is to pull the first argument from the stack, placing it in a temporary storage location. We have several bytes available on page zero, from $CB-$D1, so we'll use $CB (for the low byte) and $CC (for the high byte) to hold parameter 1. Remember, parameters are stored in high-byte, low-byte order. We first pull the high byte from the stack and store it, then the low byte. Our program now looks like this:

```
0100 ARG1L    =   $CB
0110 ARG1H    =   $CC
0160          *=  $0600 ;PUT ON PAGE 6
0170          CLD       ;BINARY MATH!
0180          PLA       ;PULL # OF ARGS
0190          PLA       ;PULL ARG1 HI
0200          STA ARG1H ;SAVE IT
0210          PLA       ;PULL ARG1 LOW
0220          STA ARG1L ;SAVE IT
```

Now we must pull the second argument from the stack and place it in temporary storage. We'll use locations $CD (for the low byte) and $CE (for the high byte) to store parameter 2. Once again, we must pull the parameter from the stack, high byte first, then low byte, storing each in the proper location. Our program so far:

```
0100 ARG1L    =   $CB
0110 ARG1H    =   $CC
0120 ARG2L    =   $CD
0130 ARG2H    =   $CE
0160          *=  $0600 ;PUT ON PAGE 6
0170          CLD       ;BINARY MATH!
0180          PLA       ;PULL # OF ARGS
0190          PLA       ;PULL ARG1 HI
0200          STA ARG1H ;SAVE IT
0210          PLA       ;PULL ARG1 LOW
0220          STA ARG1L ;SAVE IT
0230          PLA       ;PULL ARG2 HI
0240          STA ARG2H ;SAVE IT
0250          PLA       ;PULL ARG2 LOW
0260          STA ARG2L ;SAVE IT
```

Okay, we've pulled all the arguments from the stack, and we're now ready to add them together and put the result in locations $D4 and $D5, which we'll label *RESLO* and *RESHI*. The addition is a simple, two-

byte add, like many we've covered before. After the addition, we place an RTS instruction to take us back to BASIC, and the assembly code is complete. The final program looks like this:

```
0100 ARG1L  =   $CB
0110 ARG1H  =   $CC
0120 ARG2L  =   $CD
0130 ARG2H  =   $CE
0140 RESLO  =   $D4
0150 RESHI  =   $D5
0160        *=  $0600 ;PUT ON PAGE 6
0170        CLD       ;BINARY MATH!
0180        PLA       ;PULL # OF ARGS
0190        PLA       ;PULL ARG1 HI
0200        STA ARG1H ;SAVE IT
0210        PLA       ;PULL ARG1 LOW
0220        STA ARG1L ;SAVE IT
0230        PLA       ;PULL ARG2 HI
0240        STA ARG2H ;SAVE IT
0250        PLA       ;PULL ARG2 LOW
0260        STA ARG2L ;SAVE IT
0270        LDA ARG1L ;GET ARG1 LOW
0280        CLC       ;CLC FOR ADD,
0290        ADC ARG2L ;ADD TO ARG2 LOW
0300        STA RESLO ;SAVE RESULT LOW
0310        LDA ARG1H ;GET ARG1 HI
0320        ADC ARG2H ;ADD TO ARG2 HI
0330        STA RESHI ;SAVE RESULT!
0340        RTS       ;ALL DONE.
```

Now we must assemble the program and place the object file on disk. Use **BOFFO** (see issue 24 of **ANALOG Computing**) to convert the object file to BASIC DATA statements. If you don't have **BOFFO**, you can do this by hand. Using BASIC, you must POKE this data into memory, starting at location 1536, then call the subroutine with the USR call shown earlier. Figure 2 shows a BASIC program which does this.

```
10 FOR X=1536 TO 1563:READ N:POKE X,N:
NEXT X
20 ? "ENTER VALUE1, VALUE2";:TRAP 20:I
NPUT VAL1,VAL2
30 A=USR(1536,VAL1,VAL2)
40 PRINT A
50 GOTO 20
60 DATA 216,104,104,133,204,104,133,20
3,104,133,206,104,133,205,165,203,24,1
01,205,133,212,165,204,101,206
70 DATA 133,213,96
```

Figure 2.

Line 10 READS the DATA statements and POKEs each byte into page 6. This sets up the assembly subroutine so we can use it through BASIC.

Line 20 accepts the two values to be added and places them in the variables VAL1 and VAL2. Be careful that the values you enter will not add up to more than 65535, or you'll get an incorrect result.

Line 30 calls the assembly subroutine with the USR function and places the result (VAL1 + VAL2) in the variable A.

Line 40 prints the result of the addition.

Line 50 loops back to accept another set of values to add.

Lines 60-70 are the DATA statements which contain the numeric values for the assembly code. The first value, 216, is the decimal value for the CLD instruction, the first instruction in the subroutine. The next number, 104, is the value of the PLA instruction, and so on.

When the program is executed, enter two numbers and press RETURN. BASIC will send the values to the assembly routine, which will add them and return. BASIC will then print the result. Nifty, huh?

### Useful example #2.

Our first example of using the USR function showed how to call in a fixed memory location, such as page 6. Sometimes we can't use page 6 for some reason, so we must find another place to store our routines. Luckily for us, BASIC has a built-in way to reserve RAM: *Strings*!

Strings are usually used in BASIC to hold alphanumeric information, such as names, messages or other text. As you will soon see, strings are not limited to these uses. Each position in a string can hold a single byte, with a value from 0-255, just like any other memory location. What we're going to do is load the bytes of an assembly subroutine into a string and call it with a USR function.

There's one small snag with this technique, though: strings can move around in memory! Yes, that's right. They aren't always in the same place. When you execute a BASIC program, the BASIC interpreter puts the strings in the first available space it can find. If you add or delete code in your program, BASIC must move the string to the appropriate location. We can always find the string's location with the ADR function, but the code placed in the string must be made *relocatable*, or address-independent. This simply means that the code will execute no matter where BASIC places it in memory. We covered this subject in **ANALOG Computing** issue 22's **Boot Camp**, so, if you haven't read that, do so now.

Our second USR call example will return a random number from 0-65535. The assembly subroutine will be placed in the string RAND$. To call the subroutine, we'll use the code:

```
A=USR(ADR(RAND$))
```

As you can see, we are using the ADR function to find the address of RAND$, so that the USR call will know where the routine is located in memory. You should also note that there are no arguments being passed to the subroutine, so we won't have to worry about storing any parameters. We will, however, have to pull the number of parameters, which will be zero.

This time we don't care how the decimal mode is set, because we aren't going to perform any arithmetic. Therefore, our first action in the program is to pull the number of arguments from the stack. Remember to PLA this value; even if there are no arguments, BASIC puts the number of arguments on the stack.

After pulling this value, we will forget about it. So far, our code looks like this:

```
0130          *=   $0600   ;PUT ANYWHERE
0140          PLA          ;PULL # OF ARGS
```

Note that I have set the program counter to $0600, even though we will be placing this code in a string. Most assemblers require a starting address, so we're providing a dummy address. If you like, you can always place this code at $0600, since it'll execute anywhere in memory.

Next, we need to get a random number. Fortunately for us, the designers of the Atari computer systems gave us a handy memory location, RANDOM. RANDOM is located at $D20A (53770) and gives a random number from 0-255 when it's read. In order to get a random number from 0-65535, we just have to read RANDOM twice, each time placing the byte read into the BASIC return value locations $D4 and $D5. For example, assume the first RANDOM byte is 194, and that it's placed in the low byte of the result. Further, assume the second RANDOM byte is 49, and that it's placed in the high byte of the result. When we return to BASIC, the random number will be 12738 ((49 * 256) + 194). When the random number is stored, we can return to BASIC with the RTS instruction. After the addition of this code and the necessary equates, our program looks like this:

```
0100 RESLO   =    $D4
0110 RESHI   =    $D5
0120 RANDOM  =    $D20A
0130         *=   $0600    ;PUT ANYWHERE
0140         PLA           ;PULL # OF ARGS
0150         LDA  RANDOM   ;GET RANDOM #
0160         STA  RESLO    ;PUT IN LOW
0170         LDA  RANDOM   ;GET RANDOM #
0180         STA  RESHI    ;PUT IN HIGH
0190         RTS           ;ALL DONE!
```

Now you can assemble the code and convert it into BASIC DATA with the **BOFFO** program. Figure 3 shows the BASIC code needed to install and use the random number routine.

```
10 DIM RAND$(12)
20 FOR X=1 TO 12:READ N:RAND$(X)=CHR$(
N):NEXT X
30 A=USR(ADR(RAND$))
40 ? A
50 GOTO 30
60 DATA 104,173,10,210,133,212,173,10,
210,133,213,96
```

Figure 3.

Line 10 dimensions the RAND$ string to 12 bytes. That's how many bytes the routine will occupy in memory.

Line 20 READs the DATA statements in Line 60 and places them into the RAND$ string, using the CHR$ function. This function simply places the numeric values of the assembly code into the string. If you print the string, you'll see the ATASCII character equivalents of your code.

Line 30 calls the assembly subroutine and puts the random number into the variable A.

Lines 40-50 print the random number and loop back to Line 30 to get another.

Line 60 contains the decimal DATA for the random number routine.

**A new challenge.**

Now that you've seen a couple of simple examples of BASIC USR calls, I've got a challenge for you to try at home. Write a USR call which will accept two arguments. Add them and divide the total by two, returning this value to BASIC. This is a simple, average routine, and you should be able to handle it easily, since we've covered all the techniques you need to solve the problem. The answer will be an integer, so don't worry about fractional results.

When you get a solution, let me know. Send your solutions to:

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Next issue, we'll go deeper into USR calls, including variable-argument calls. Stay tuned! □

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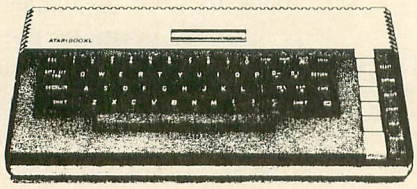

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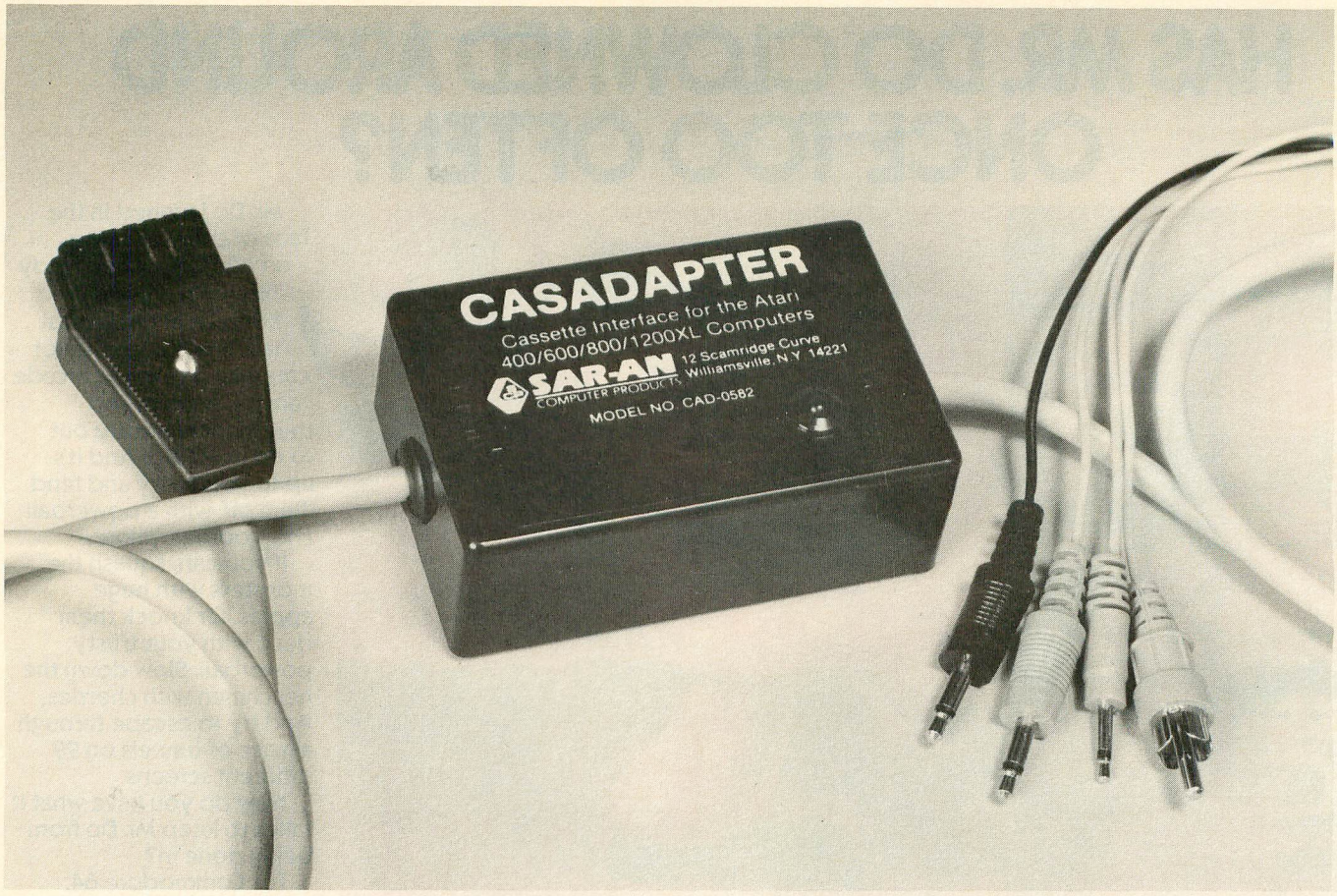


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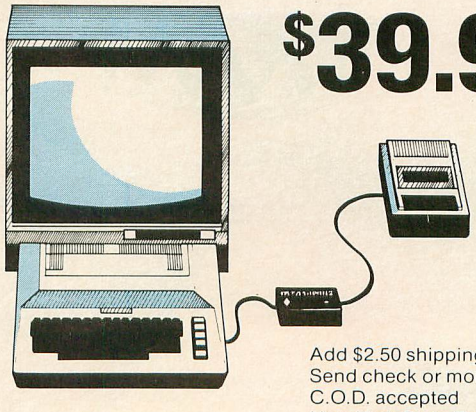

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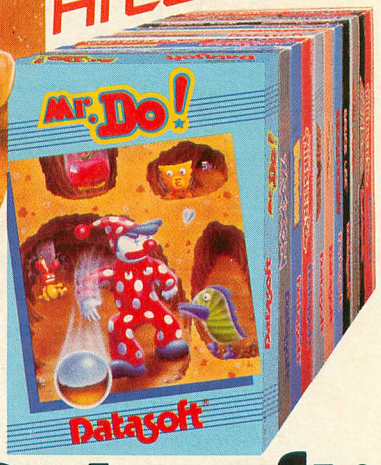


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# An Atari BASIC Tutorial PART 1.

by Philip Altman

Nearly all of us, beginner and expert alike, started programming in Atari BASIC. This language was first supplied in a cartridge and now, with minor revisions, is built into the new XL machines. Now that you've learned to *use* BASIC, ever wonder how it works? In this series of articles, we'll dissect Atari BASIC, look at its internal structure and find out much of what is going on behind the READY prompt.

The information presented here comes from several years' experience with Ataris, disassembly of portions of the BASIC ROM and from several publications, including *De Re Atari* and *Compute's First* and *Second Books of Atari*. For the technically minded, those interested in the finer details, *Compute's Atari BASIC Source Book* is highly recommended. Included is the entire BASIC source code, amounting to more than 130 pages. Although the ROM code can't be modified, assembly language programmers may be interested in tracing through it.

**BASIC—an interpreted language.**

Atari BASIC is a high level computer language. It allows us to communicate with the microprocessor using English-like statements, arithmetic expressions, logical operators (<, >, etc.), and so on. The heart of the Atari, the 6502 microprocessor, is only capable of executing a sequence of numbers representing a series of elementary instructions. BASIC is a program which translates for us. It is an example of an interpreted language, which means that the translation process occurs as the program is run. One advantage of Atari BASIC is that some pre-processing, according to a complex set of internal rules, occurs as lines are entered. This is how BASIC detects certain types of errors before a program is run. Compiled languages, in contrast, convert all program statements to machine code before execution. When error-free, a compiled program runs much faster, but programming can be difficult to learn and tedious. If mistakes are made, compiled programs usually have to be debugged, re-compiled, run again, and so on.

**Tokens.**

You wouldn't recognize a BASIC program if you examined it as it exists within the Atari. This is because BASIC statements, operators and other program data are each internally represented in tokenized, or numeric, form. These tokenized programs run faster and consume less memory. There are four types of tokens in BASIC programs, ranging from 14 to 255. Tokens 128 to 255 are reserved to identify variables (this is why BASIC allows only 128 unique variables). When a string constant is tokenized, it is preceded first by a 15, which identifies it as a string constant, and then by another number representing its length. The string's contents follow. Numeric constants are preceded by a 14. Remaining tokens represent statements (e.g., CLOSE, DIM) and operators (e.g., +, *, >).

As program lines are entered, BASIC will find the various statements and operators in internal look-up tables from which their respective tokens are derived. These tables are located at the addresses 42159 and 42979, respectively (42143 and 42974 for XLs). Program 1 will list these tokens and their corresponding statements/operators to the system printer or screen, if you have no printer. Press BREAK when the listing is complete.

Not shown are statement tokens, 54, representing the implied "LET" before a variable, and 55, the "ERROR" token. Note that among the operator tokens are several "=", each reflecting a different use of this symbol. Finally, three tokens are non-printing. Two (56 and 57) are array left parentheses, stored with array names in the VNT. The third (22) is the terminator token found at the end of most lines. Statements for which no tokens are found generate errors. When a program is run, BASIC uses these token values as indices into other tables which point to the appropriate execution instructions.

**BASIC's tables.**

BASIC will keep track of a tokenized program by expanding and contracting a set of five tables in the memory. Each is pointed to by data in a pair of addresses in memory page zero (0-255). The address of the variable name table, for example, is =PEEK(130)+256*PEEK(131). These tables, along with their functions and pointers, are detailed below.

1. VARIABLE NAME TABLE (130, 131) — a sequential list of all variable names starting with the first variable entered. Tokens are assigned in order as variables are defined, beginning with 128. Array names have a ( added at the end, and strings have a $. The last character of each variable name is also stored in inverse video. By examining this character, BASIC then knows where each name ends and the variable type. The end of the VNT is marked by a dummy zero byte and pointed to by addresses 132 and 133. Program 2 is a short utility which will display the variable name table of a program, so long as it has no lines higher than 31999. Enter the lines and LIST the program to cassette or disk. To use it, load your program, ENTER the utility, and type *G.32000*.

2. VARIABLE VALUE TABLE (134, 135) — stores information on each variable in the same order. BASIC variables may be scalar (e.g., A=5), arrays (e.g., A(1)=5) or strings (e.g., A$(1,1)="5"). Each VVT entry consists of eight bytes. The first two are the same for every variable; the


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The Atari SIG has logged over 100,000 calls—with over 60,000 messages being posted! They have a staff of highly competent SYSOPs, headed up by Ron Luks, who are more than happy to help you. Their program database contains well over a megabyte (that's one million bytes, folks!) of Atari programs that can be downloaded into your computer.

So, if you need to get in touch with **ANALOG Computing**, you can now do it through CompuServe. Our user numbers are:

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first indicates the type (scalar, array or string) and the second, the variable index (token-128). The remaining six bytes describe specific information about the variable. In the case of a scalar, they represent the six-byte numeric variable value, expressed in BCD (binary coded decimal). For arrays and strings, they include size and length data and a pointer into the string/array table (see below), telling BASIC where to find the current values of each of the string/array elements.

3. STATEMENT TABLE (136, 137) — stores program lines in tokenized form, in ascending numeric order. When a line is added to a program, the statement table is simply expanded to make room for the new tokens. For each new variable in the line, the VNT is enlarged and a new eight-byte VVT entry is created. The opposite occurs when a line is deleted, except that any variable names now unused are retained in the variable tables. Thus, after a while, the VNT may become cluttered with variable names no longer used in a program. BASIC has no direct means of purging these names. When a line is inserted within a program, BASIC must first determine if the line already exists. If so, the old tokens are replaced by the new tokens, updated VNT and VVT entries are created for any new variables, and ST bytes are moved up or down in memory as needed to accommodate the new line. If the inserted line is new, then BASIC puts it in its correct position by line number. Clearly, the jobs of entering lines and editing programs require a lot of byte manipulation, which BASIC accomplishes with quick memory management routines. The infamous lock-up bug, corrected in revision B (XL BASIC), resided in these routines. The last line in the statement table is the immediate mode line, assigned line number 32768. Your last instruction (LIST, RUN, etc.) is tokenized and stored here.

The following two tables are created when a program is executed:

4. STRING/ARRAY TABLE (140, 141) — a changing table which holds the current values of each element in the string/array variables. Entries in this table are created when the program is run and each string/array is dimensioned. Each string/array variable has a pointer in the VVT, telling BASIC where in the string/array table to locate its values.

5. RUNTIME STACK (142, 143) — used by BASIC mainly during execution of FOR/NEXT loops and GOSUB/RETURN/POPs. Important data is temporarily saved here, including exactly where in a program line to RETURN after completing a GOSUB. For FOR/NEXT loops, the variable token, loop limit and increment (step value) are stored.

There are three additional pointers to note. While BASIC programs and tables move higher in memory as they enlarge, the Operating System may need to move the screen display lower to accommodate graphics modes which require more memory. These pointers keep BASIC and the Operating System from conflicting with each other. In LOMEM (128, 129), the OS tells BASIC where it can begin building its tables. Without DOS, this is set to 1792 on power-up and reset. In APPMHI (14, 15), BASIC tells the OS the highest address it has used, so the OS knows just how low in memory it can move screen data without overwriting program bytes. Closely related is MEMTOP (741, 742), in which the OS tells BASIC how much memory it is using for the screen display.

**A tokenized line.**

Program lines are stored in a specific format. Let's take a look at the anatomy of a tokenized BASIC line as it exists in the statement table. The first two bytes always contain the line number, stored in two-byte binary form, low byte first. To retrieve the decimal line number, multiply the high byte by 256 and add the low. Valid line numbers range from 0 to 32767. The next memory location contains the line length

*(continued on next page)*

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in bytes. Adding this value to the starting address of the line gives the address of the next program line. Since lines may have multiple statements (each separated by :), the following byte shows the number of bytes in the first statement. If there is only one statement, then the line and statement length bytes will be the same. Otherwise, the statement length byte will be less. Each statement in a line starts with a byte representing the accumulated lengths of all the preceding statements. This means that the last statement must start with a byte that is equal to the overall length of the line. Next come the tokens actually comprising the line. Most lines are terminated with an end-of-line token (22).

Now, enter Program 3. After entering it, LIST it to cassette or disk. Given a line number, the program displays the line's starting address in the statement table and its length. It then shows the tokens which make up the line in numeric and character format. In our next session, we'll use this program and what we've learned so far to analyze some simple BASIC lines. Then, we'll look at the structure and components of Atari BASIC and their interactions. □

Program 1.

```
5 REM PROGRAM 1
10 REM THIS PROGRAM DISPLAYS BASIC'S S
TATEMENT AND OPERATOR TOKENS
20 REM FOR XL'S: SNTAB=42143, OPNTAB=4
2974
30 SNTAB=42159:REM ADRS OF STMT TOKEN
TBL
40 OPNTAB=42979:REM ADRS OF OPERATOR T
OKEN TBL
50 TRAP 60:OPEN #1,8,0,"P:":IO=1:GOTO
70:REM OUTPT TO PRNTR IF THERE
60 ? "K":POKE 82,0:POSITION 0,0:REM SO
 WE CAN GET BOTH ON SCRN
70 I=SNTAB+2:REM BEGIN AT SNTAB ADRS+2
80 STEP=3:REM INCREMENT/ENTRY
90 GOSUB 170:? #IO:? #IO
100 TKN=18:REM OP TKNS START AT 18
110 I=OPNTAB+2:REM BEGIN AT OPNTAB ADR
S+2
120 STEP=1:REM INCREMENT/ENTRY
130 GOSUB 170
140 CLOSE #1
150 POKE 82,2:GOTO 150:REM RESET LEFT
MGN
160 REM SHOW TOKENS AND STATEMENTS/OPE
RATORS
170 IF PEEK(I)=0 THEN RETURN :REM TBLS
 END WITH DUMMY ZERO BYTE
180 ? #IO;TKN;"-";:REM SHOW TKN #
190 IF PEEK(I)>=128 THEN ? #IO;CHR$(PE
EK(I)-128);" ";:I=I+STEP:TKN=TKN+1:GOT
O 170:REM LAST CHR IN INV
200 ? #IO;CHR$(PEEK(I));:I=I+1:GOTO 19
0:REM SHOW CHRS
```

CHECKSUM DATA.
*(see page 20)*

```
5 DATA 232,417,351,555,577,954,87,939,
297,183,748,400,430,969,647,7786
150 DATA 411,292,705,250,533,710,2901
```

Program 2.

```
32000 REM PROGRAM 2
32010 REM VARIABLE NAME LISTER
32020 VNTB=PEEK(130)+256*PEEK(131):REM
 ADRS OF VAR NAME TBL
32030 VNTD=PEEK(132)+256*PEEK(133):REM
 ADRS OF END OF VNT
32040 ? "K↓↓        VARIABLE NAME TABLE
":?
32050 FOR ADRS=VNTB TO VNTD-1:IF PEEK(
ADRS)>128 THEN ? CHR$(PEEK(ADRS)-128);
"   ";:GOTO 32070:REM LAST CHR IN INV
32060 ? CHR$(PEEK(ADRS));:REM SHOW VAR
 NAME CHAR
32070 NEXT ADRS:?
32080 END
```

CHECKSUM DATA.
*(see page 20)*

```
32000 DATA 817,263,317,235,75,882,297,
478,557,3921
```

Program 3.

```
32000 REM PROGRAM 3
32010 REM BASIC LINE ANALYZER
32020 ? "K↓ENTER LINE # ";:INPUT LNBR:
HI=INT(LNBR/256):LO=LNBR-HI*256:? :REM
 GET HI,LO BYTES OF LN #
32030STMTAB=PEEK(136)+256*PEEK(137):RE
M ADRS OF STMT TBL
32040 ADRS=STMTAB:REM START AT BEGINNI
NG OF STMT TBL
32050 IF PEEK(ADRS)=LO AND PEEK(ADRS+1
)=HI THEN 32090:REM TEST EACH LN #
32060 ADRS=ADRS+PEEK(ADRS+2):REM STEP
TO NEXT LINE
32070 IF PEEK(ADRS+1)=128 THEN ? "LINE
 ";LNBR;" NOT FOUND":END :REM ALL DONE
 IF IMMED MODE LINE REACHED
32080 GOTO 32050:REM KEEP LOOKING
32090 ? "LINE ADDRESS = ";ADRS:? "LINE
 LENGTH = ";PEEK(ADRS+2):? :REM SHOW P
ARAMETERS
32100 FOR I=ADRS TO ADRS+PEEK(ADRS+2)-
1:? PEEK(I);"-";:NEXT I:? :? :REM TOKE
N DUMP
32110 POKE 766,255:REM DISPLAY CONTROL
 CHARS ONLY
32120 FOR I=ADRS+4 TO ADRS+PEEK(ADRS+2
)-1:IF PEEK(I)=155 THEN ? "<CR>":GOTO
32140:REM ASCII DUMP
32130 ? CHR$(PEEK(I));"-";:REM SHOW CH
ARS
32140 NEXT I:?
32150 POKE 766,0:REM RESTORE CONTROL C
HAR FUNCTIONS
32160 END
```

CHECKSUM DATA.
*(see page 20)*

```
32000 DATA 819,38,332,131,286,183,705,
222,395,167,668,845,1,231,16,5039
32150 DATA 68,554,622
```

# Atari Stocking Stuffers

## For any size stocking or budget.

by Arthur Leyenberger

With the holidays approaching, Atarians, like everyone else, are starting to think about what gizmo or gadget they *must* have to make their Atari system complete. Maybe it's that new joystick that will make high game scores the rule rather than the exception. . .or perhaps it's an application program that has finally become available for Atari—the one that will do *everything*: slicing, dicing and babysitting the kids.

Regardless of how many hours you've logged at the keyboard, chances are there's something that will help you get more out of using your Atari. The problem is that you may not be aware that the product even exists. Worse yet, a gift-giving friend or relative may also be unaware of that special product.

To save you the hassle of visiting every computer store in town, then having to tell someone what you'd like (how tacky!), here is a compilation of goodies for the Atari user. Some of the products I will mention by name, having actually used/tested/played each one. Other items will be mentioned in general, with a couple of suggested brand names. A list of the manufacturers and their addresses can be found at the end of this article.

You will see a lot of so-called Brand Xs here. Why? Because many times they offer the most value for your dollar. Also, when I run across an excellent product made by a small company, I like to give them a plug. This whole, wacky world of personal computers was started by just this type of folks. Sadly, these entrepreneurs are giving way to the IBMs and AT&Ts.

I can't mention every Atari-related product ever made. I can't even list all of the good Atari products I use or know about. My apologies in advance if I leave out your favorite one. As far as my objectivity goes, that's a tough one. I don't think I can be truly objective, because, at the very least, I have standards —which are a form of prejudice. But I need these standards to form judgments, because the best I can offer you is informed judgment with a deliberate attempt at fairness.

### Stocking stuffers for under $10.

What can you buy for $10 today? Actually, quite a number of useful and interesting items come in at or under this price. Here are a few for your consideration.

Do you ever get confused about which key goes with

which graphic symbol? Or are you tired of looking up those symbols in your dog-eared, tattered copy of *Your Atari Computer*? The only solution I know of is to spend $4.95 for a set of **Graph-Fix** keyboard labels. Available from Dovestar Creative Concepts, these self-adhesive labels stick onto the keys on your Atari keyboard. You'll never get those graphics characters confused again. One size fits all Ataris.

Here is another neat gadget: the **Lineminder** from HL Enterprises. It's a $4.95 plastic rule that is useful as a reading aid. Like a miniature T-Square, it can slide down the edge of a book or magazine to help you keep your place. It's really handy for those arduous typing sessions, when you're entering a program.

**Graph-Fix.**

Does your trigger finger ever get tired of constantly pressing the fire button on your joystick? If so, you need a **Pointmaster Fire Control Adapter** from Discwasher. It lists for $6.95, but I've seen it at Toys "R" Us for about three bucks. When this gizmo is inserted between your joystick and computer, holding down the fire button causes a constant stream of pulses to be sent to the computer. It's as if you were pressing the button fifty times a second. Using this device isn't really cheating, but it sure helps with games like **Robotron**, **Gyruss** and **Centipede**.

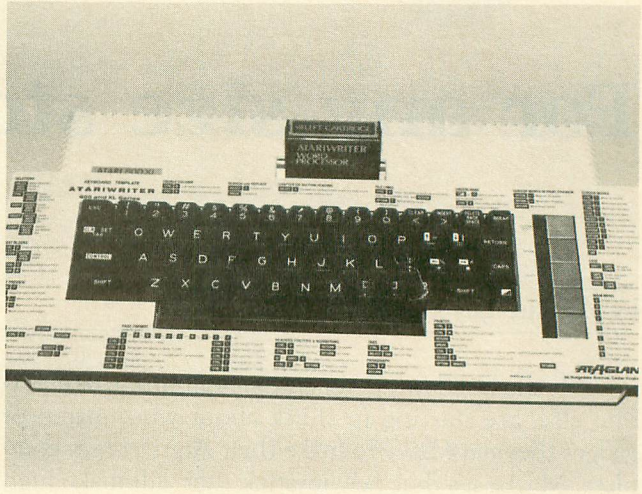
Lillian Vernon is a mail-order company whose catalog lists the kind of bric-a-brac that eventually ends up at garage sales. However, there is one item that, although not Atari-related *per se*, would be fun to find in a stocking. It's called the computer clock and sells for $9.95. It looks like a miniature computer with an LCD clock in the screen.

I don't know about you, by my computer is located in a very dusty environment. I have covers on just about all of my equipment. Omnicron Industries sells a whole range of covers for Atari computers and peripherals under the **Classic Covers** name. The covers retail for $6.95 and will keep dust, moisture and even a spilled drink from damaging your equipment.

**Goodies for under $30.**

**AtariWriter** is one of the easiest to use word processors around, but, like anything else, it still requires a certain amount of time to learn. At-A-Glance has a useful product that will minimize the time required to get up to speed with **AtariWriter**. It's called the **At-A-Glance AtariWriter Template**. This $14.95 plastic template fits over the keyboard of an Atari 800 or XL series computer, allowing access to all of the keys. Printed on the template are the various commands, control codes and other information for using **AtariWriter**. It's like having training wheels while you learn to use the program. At-A-Glance also sells templates for **SynCalc** and **SynFile** (Synapse), and **Letter Perfect** and **Data Perfect** (LJK).

I've been using both sides of my single-sided, single-density disks for over two years without any problems. A useful tool for punching a second write-protect notch in the disk jacket is the **Nibble-Notch**. It's a square hole-punch with a guide for the corner of the disk. The **Nibble-Notch** makes perfect notches every time and sells for $14.95.

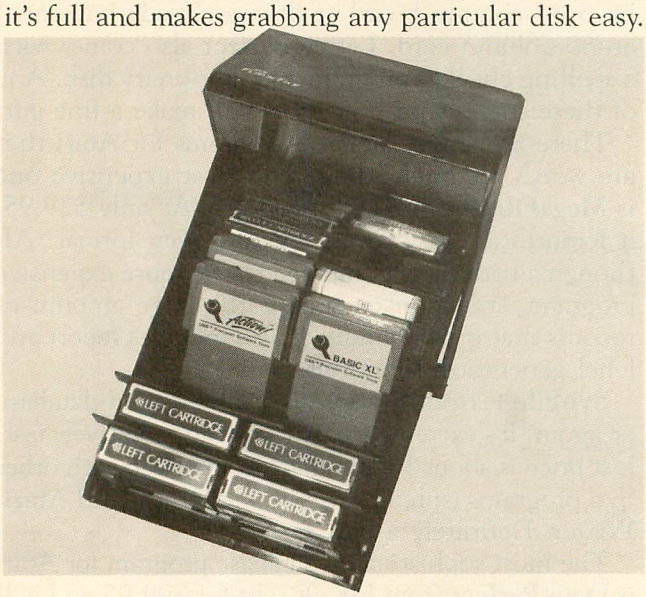


**At-A-Glance AtariWriter Template.**

If someone wants to get started in telecommunications at a reasonable cost, they could do worse than buy an Atari 1030 modem. They go for less than $75 now. To make it upload, download and work like a modem should, you need a more sophisticated terminal program than the one built into the 1030. **E.T. Modem** (Sector One International) sells for $19.95 and will make using an Atari 1030 or 835 modem like driving one of the big rigs. It's easy to use and has just about all the features a novice or an experienced user could want.

As you use your Atari, you accumulate things. Cartridges, disks and whatnot appear everywhere. Unless you organize all of it, you'll soon be unable to find your computer beneath the mess. Innovative Concepts has a wide variety of disk and cartridge holders that sell for $5.95 to $29.95. Two products I use are the

50-disk **Flip 'N File** flip-up tray and the 10-cartridge **Flip 'N File** flip-up holder. Each lists for $29.95 and will be quite useful in keeping your work area tidy. Other companies also make the same type of product. Just be sure the one you buy won't spill disks when it's full and makes grabbing any particular disk easy.




**Flip 'N File.**

Speaking of keeping your disks organized, another way to store disks is with a library case. These cases hold 10 disks and store on a shelf like a book. When opened, the inside swings out, and the disks stand upright. You can then flip through the disks to find the one you're looking for.

SRW Computer Components has taken this idea one step further by coloring the entire library case. Sold under the **Color Coder** name, a set of five disk library cases in assorted colors will come to $24.95. And, they're rather attractive.

I'm not a computer hardware hobbyist, but for the many of you who are, Gemini Enterprises sells a cartridge prototyping kit called the **Halcon A101**. It can be used for ROMs or EPROMs and sells for $17.95. The kit includes cartridge prototyping board, cartridge cover and instructions.

If you've ever wanted to be able to list your BASIC programs to the printer and actually see those graphics and inverse characters, then you'll want to find **Megafont II** under the tree. From XLent Software, this $24.95 program is a combination program lister and graphics dumper. It works with Epson, Prowriter, Gemini and Riteman printers. It also lets you use your own character sets for use in listing files.

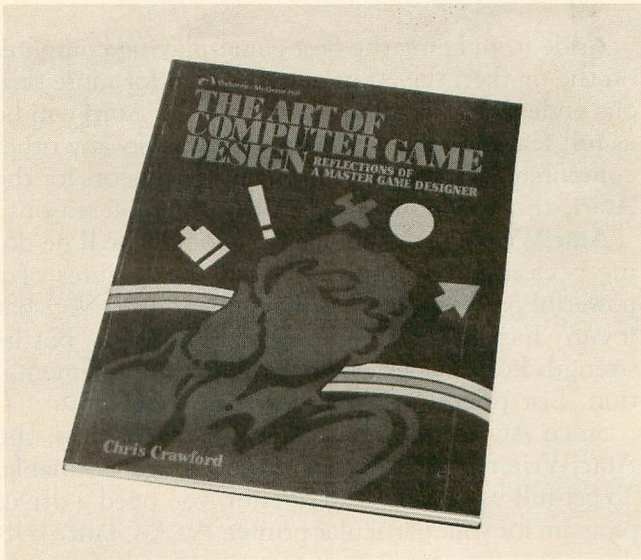
There are several other, more generic gifts that fall into this price range. One of the best gifts you could give (or receive) is a membership to an Atari user group. There are many fine groups around the country, whose memberships typically cost about $20. They have monthly meetings, publish newsletters and often have libraries of public domain software.

Books and magazine subscriptions also fall into the under-$30 category. You guessed it—**ANALOG Computing** is a very good gift for a new user or *anyone* who doesn't already receive it. If you're reading this, you know how valuable **ANALOG Computing** is. I can't think of a better gift than finding the latest issue (or a subscription) in your stocking.

A book that has become the bible of Atari computer users is *Your Atari Computer* by Poole, McNiff and Cook. It's published by Osborne/McGraw-Hill and will set you back about $16. Another book with equal status is *The Atari User's Encyclopedia* by Gary Phillips and Jerry White. It costs $20 and is published by The Book Company (Arrays). These two belong on every Atarian's bookshelf.

One of the best books for learning BASIC on an Atari 800 or XL is published by Hayden. Called *Basic Atari BASIC*, it sells for $14.95 and was written by Jim Coan and Richard Kushner. This book was specifically rewritten to include information on such subjects as XL graphics modes, sound and player/missile graphics.

If you'd like to learn more about how computer games are designed, Chris Crawford's book, *The Art of Computer Games Design*, is for you. Published by Osborne/McGraw-Hill, it sells for $14.95. Crawford is an interesting person who expresses his views very well here. The book will be useful for people who are actually designing games or for those who like to play them.




**The Art of Computer Games Design.**

There are a handful of other items that would be welcomed by any Atari user. Disks, printer paper, ribbons, or even a printer or monitor stand would all be useful. Or how about an outlet strip with a built-in surge protector?

**Gifts that keep on giving.**

There are thousands of products made for the Atari computers. But there are some that will be used over and over. They have value and staying power.

Programming languages make a versatile gift with nearly guaranteed long use. **Action!** by OSS is in cartridge format and will run in any system with a 16K minimum. **Action!** is dozens of times faster than BASIC, so it's a popular language in user circles. Also by OSS is MAC/65, **ANALOG Computing**'s favorite machine language software. Each language retails for $99. And, **ANALOG Computing** recommends the newly-released book *Assembly Language Programming for the Atari Computers* by Mark Chasin, McGraw-Hill, $15.95.

**SynFile+ and Data Perfect.**

Aside from being the best game-playing computer on the market, the Atari is well suited for more serious endeavors. Word processing on the Atari can be as full featured and easy to perform as on any other computer. Of the dozen or so word processors for the Atari, three stand out—each for different reasons.

**AtariWriter** is the choice for people who'll be doing occasional writing. It has all the features of a powerful program, but is still simple to use. Not that it can't handle more complex writing needs, but its strength lies in its excellent design and implementation. List price has come down to about $50.

Since Atari's APX has gone out of business, the **AtariWriter** printer drivers are no longer available. To get full use out of **AtariWriter**, you need a driver program for your particular printer. At-A-Glance sells driver programs for just about every brand of printer. They cost $14.95 each (specify printer) and are available for Epson, Okidata, Prowriter, BMC and Panasonic printers.

A word processor that I highly recommend for anyone doing a lot of writing is **The Writer's Tool** from OSS. **The Writer's Tool** is fairly new, but it has so many features designed to make writing easy that it ranks in the top three. It is very powerful, costs $130, and uses OSS's exclusive bank-selecting Super Cartridge.

The third word processor on my recommended gift list is **Letter Perfect** by LJK ($99.95). I've been writing about computers for roughly two years now, and **Letter Perfect** has been with me all the way. It and OSS's **Writer's Tool** are equally powerful, but **Letter Perfect** has the advantage of working with either a bit-3 80-column board or (if you already have one) an 80-column card. **Letter Perfect** also comes with a spelling checker program and dictionary disk. Any of these three word processors will make a fine gift.

There are three database programs for Atari that are worth recommending. The least expensive one is **MegaFiler** from XLent Software. At only $29.95, it features an easy to use menu-driven format. Although a little slow compared to the more expensive programs, its claim to fame is the large amount of records that it can handle. It also includes report and label generation functions.

**SynFile+** from Synapse is another good database program. It's extremely easy to use and relatively fast. List price is about $50, and it can interface with other Syn programs (spread sheet and graphics) and **AtariWriter**. Definitely a best buy.

The most sophisticated database program for Atari is **Data Perfect** from LJK. It sells for $99.95 and will interface with **Letter Perfect**. It can be used with the bit-3 80-column board and has an extensive report generator built in. Learning the ins and outs of it, however, requires some time and patience.

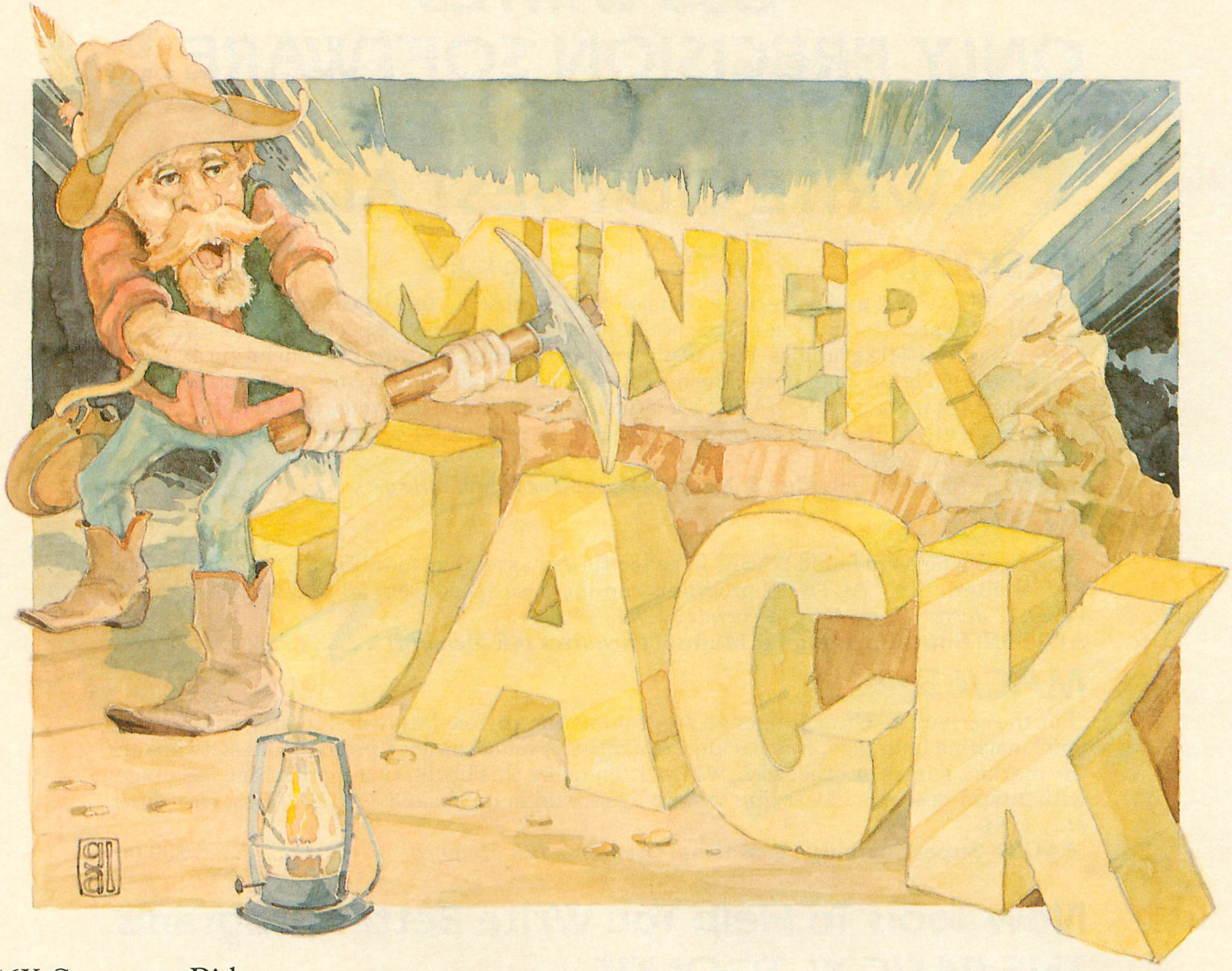
One of the best programs I've seen for the Atari (or any other computer) is Synapse's **SynCalc** spreadsheet program. It is very powerful, yet still easy to use. It has both a menu-driven and a command mode of operation—and literally blows **VisiCalc** right out of the water. List price is about $50. The program is so good that *I'm* giving it to someone this Christmas (don't read this, Sally). **SynCalc** is the kind of program that will find many uses, from preparing income tax forms to budgeting to record keeping.

Another useful program is Electronic Art's **Financial Cookbook** (see the review on page 91). For a $50 price tag, this program includes dozens of financial "recipes" to calculate everything from mortgages to IRAs. Highly recommended.

The best graphics and statistical analysis package available for the Atari is **B/Graph**. With it, you can make bar charts, histograms, scatter plots and pie charts. Descriptive statistics and multiple regressions can also be performed on the data. It's very easy to use and has excellent documentation, including tutorials. Originally sold under the In-Home Software label for $99.95, its rights have gone to Batteries Included. If Batteries follows their usual sane pricing policy, the new **B/Graph** will probably be closer to $50.

To get you started using the vast resources of CompuServe Information Service, the **CompuServe Starter Kit** is a good value. For $39.95, you receive five free hours of connect time and a thorough manual.

*(continued on page 93)*




16K Cassette or Disk

by Randy Schulze

*(When Randy submitted this article, his cover letter stated that* **Miner Jack** *was composed of programs and information from* **ANALOG Computing**, *one of his prime sources of tutelage. We're pleased to see the results of his efforts. —Ed.)*

Are you ready to dig for gold? Are you ready to face the "Gold Guard," suffocate in thin air deep in the tunnels, or accidently stumble into a poison gas pocket? Then grab your pickax, plug in your joystick and go for the gold!

As **Miner Jack**, you must dig tunnels and pick up gold nuggets. Once you have all the gold, you must return to the tunnel entrance to deposit it safely. After you've accomplished this, the next level will then start.

**The dangers.**

You must avoid deadly gas pockets and being consumed by the Gold Guard. Beware of the guard; he's not as dumb as he first appears. Remember, he *is* a guard, not a bloodthirsty monster. Also, he will not appear until a gold nugget is taken.

Do not take too long digging for gold. The air soon gets stale while you are deep in the tunnels. When you hear the blip, blip, blipping, get to the tunnel entrance as fast as you can for a breath of fresh air. You may then resume digging.

**Degrees of difficulty.**

The difficulty in **Miner Jack** increases as you get to higher levels. There are more gold nuggets to dig for, more gas pockets to avoid. The air gets stale a little sooner, and things start moving a little faster. You get three lives to gather up as much gold as you can.

There is no limit to the number of different screens this game can generate! The "men left" indicator is in the upper right corner by the moon. The gold accumulated and levels completed are displayed after the third life has been used. To start a new game, press the fire button.

Let the digging begin! □

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"BASIC XL is a fast and powerful extension of Atari BASIC, totally compatible with virtually all software. Its many features make programming easy, especially games that require player/missile graphics. For people writing business software or translating existing programs from other computers, the new string arrays and other string-handling features make the task manageable. BASIC XL is a truly professional language that should become standard in all future Atari computers. Overall Rating—A." *The Addison-Wesley Book of Atari Software 1984*

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## ACTION!

"For those who have found BASIC to be too slow or assembler too difficult, ACTION! is the logical alternative. ACTION! programs can increase speed from 50 to 200 times that of BASIC." *Jerry White, Antic, February 1984*

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## MAC/65

"For the serious machine language programmer or anyone interested in programming in 6502 machine language, this package is a must. A lot of the good professional software on the market, games or otherwise, was written using this brute. Coding machine language with anything else is like trying to swim upstream in quicksand." *ACE Of West Hartford, May 1984*

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CIRCLE #156 ON READER SERVICE CARD

BASIC listing.

```
100 REM ********************
110 REM *    MINER JACK    *
120 REM *        BY        *
130 REM * RANDY  SCHULZE *
140 REM ********************
150 REM
160 GOTO 1240
170 SOUND N2,N10,N10,N8:FOR T=N1 TO N2
:NEXT T:SOUND N2,N0,N0,N0:AA=AA+N1:IF
AA>50 THEN AA=N0:POP :GOTO 300
180 IF Y<N5 THEN POKE N10+N9,N0:AA=N0
190 POKE 77,N0:RETURN
200 IF MAN=N2 THEN COLOR N32:PLOT 19,N
2
210 IF MAN=N1 THEN COLOR N32:PLOT 19,N
1
220 RETURN
230 LOCATE X,Y-N1,XX:IF XX=N161 THEN C
OLOR N32:PLOT X,Y-N1
240 LOCATE X,Y,XX:IF XX=N161 THEN COLO
R N32:PLOT X,Y
250 LOCATE X,Y+N1,XX:IF XX=N161 THEN C
OLOR N32:PLOT X,Y+N1
260 LOCATE X-N1,Y,XX:IF XX=N161 THEN C
OLOR N32:PLOT X-N1,Y
270 LOCATE X+N1,Y,XX:IF XX=N161 THEN C
OLOR N32:PLOT X+N1,Y
280 RETURN
290 SOUND N2,14,N10,N8:SCORE=SCORE+N10
*N10:GT=GT+N1:GG=N0:SOUND N2,N0,N0,N0:
RETURN
300 GOSUB 1110:MAN=MAN-N1:GOSUB 230:GO
SUB 200:GG=N1:IF  NOT MAN THEN 1150
310 GOTO 330
320 REM **** MAIN LOOP ****
330 X=N9:Y=N4:FOR T=N1 TO 50:SOUND N1,
12,12,N10:NEXT T:SOUND N1,N0,N0,N0
340 S=STICK(N0):X1=X:Y1=Y
350 IF S<>15 THEN SOUND N0,54,N8,N1
360 DX=(S=N7)-(S=N10+N1):DY=(S=N10+N3)
-(S=N10+N4)
370 FOR T=N1 TO DIF:NEXT T
380 X=X+DX:Y=Y+DY
390 IF X<N1 OR X>(N10+N8) THEN X=X1
400 IF Y<N4 OR Y>22 THEN Y=Y1
410 SOUND N0,N0,N0,N0
420 LOCATE X,Y,ZZ:IF ZZ=N35 THEN GOSUB
 290
430 IF ZZ=N4 THEN X=X1:Y=Y1:SOUND N1,2
54,N6,N6:FOR T=N1 TO N10*N2:NEXT T:SOU
ND N1,N0,N0,N0
440 IF ZZ=N168 THEN SOUND N1,12,N8,N8:
FOR T=N1 TO 150:NEXT T:SOUND N1,N0,N0,
N0:GOTO 300
450 IF ZZ=N162 THEN 300
460 COLOR N161:PLOT X,Y
470 IF S<>15 THEN COLOR N32:PLOT X1,Y1
480 IF PEEK(N10+N9)>AIR THEN GOSUB 170
490 IF GT>=GOLD-N1 AND Y<N5 THEN SCR=S
CR+N1:GG=N1:AIR=AIR-N1:V=N9:W=N4:GT=N0
:LEVEL=LEVEL+N1:GOTO 730
500 IF AIR<N2 THEN AIR=N2
510 IF GG=N1 THEN 340:REM GUARD NOT ON
 BOARD
520 V1=V:W1=W
530 DIRX=SGN(X-V):DIRY=SGN(Y-W)
540 V=V+DIRX:W=W+DIRY
550 IF V>N9*N2 OR V<N2 THEN V=V1
560 LOCATE V,W,MM:IF MM=N133 OR MM=N4
OR MM=N168 OR MM=N35 THEN V=V1:W=W1
570 IF MM=N161 THEN 300
580 COLOR N162:PLOT V,W
590 IF V<>V1 OR W<>W1 THEN COLOR 32:PL
OT V1,W1
600 GOTO 340
610 N1=1:N2=2:N3=3:N4=4:N5=5:N6=6:N7=7
:N8=8:N9=9:N10=10:N0=0:SCORE=N0:GT=N0:
LEVEL=N0:GG=N1:GAME=N1
620 N161=161:N162=162:N35=35:N133=133:
N38=38:N168=168:SCR=N1:MAN=N3:AIR=N10:
V=N9:W=N4:N32=32
630 POKE 106,PEEK(106)-N2:GRAPHICS N1+
(N8+N8):A=PEEK(106)*256:SET=PEEK(106):
POKE 756,SET
640 FOR T=N0 TO N7:POKE A+T,N0:NEXT T:
REM SPACE
650 RESTORE 670
660 FOR T=N8 TO N9*N7+N8:READ CHAR:POK
E A+T,CHAR:NEXT T:REM CHARACTERS
670 DATA 24,60,24,126,90,60,36,102,231
,165,231,24,126,165,129,255,126,195,18
9,191,177,189,195,126
680 DATA 24,60,54,126,127,251,159,255,
255,247,255,191,251,255,223,255,0,0,24
,24,0,0,0,0
690 DATA 60,110,255,191,251,255,110,60
,165,60,68,130,70,40,36,40
700 RESTORE 670
710 REM **** PLAYFIELD SETUP ****
720 REM **** STARS ****
730 FOR M=N1 TO N10:B=RND(N0)*(N10+N6)
:C=RND(N0)*N3:COLOR N38:PLOT INT(B),IN
T(C):NEXT M
740 REM **** EARTH ****
750 COLOR N133
760 FOR M=N5 TO N10*N2+N3:PLOT N0,M:DR
AWTO N10+N9,M:NEXT M
770 REM **** ROCKS ****
780 GOSUB 1000:POKE N10+N9,N0
790 FOR M=N1 TO ROCKS:B=RND(N0)*(N10*N
2):C=RND(N0)*(N10*N2+N3):IF C<N6 THEN
C=N6
800 COLOR N4:PLOT INT(B),INT(C):NEXT M
810 REM **** GAS POCKETS ****
820 FOR M=N1 TO GAS:B=RND(N0)*(N10*N2)
:C=RND(N0)*(N10*N2+N3):IF C<N6 THEN C=
N6
830 COLOR N168:PLOT INT(B),INT(C):NEXT
 M
840 REM **** MOON ****
850 COLOR 39:PLOT N10+N7,N2
860 REM **** GOLD ****
870 FOR M=N1 TO GOLD
880 B=RND(N0)*(N10*N2):C=RND(N0)*(N10*
N2):LOCATE INT(B),INT(C),XX:IF XX=N35
THEN 880
890 IF C<N7 THEN 880
900 IF B<N1 OR B>18 THEN 880
910 COLOR N35:PLOT INT(B),INT(C):NEXT
M
920 REM **** MEN LEFT INDICATOR ****
930 IF  NOT GAME THEN 960
940 GAME=N0
950 COLOR N161:PLOT 19,N1:PLOT 19,N2
960 RESTORE 990
970 READ B,C:IF B=-999 THEN 330
980 COLOR N4:PLOT B,C:GOTO 970
990 DATA 1,4,2,4,3,4,4,4,5,4,6,4,7,4,8
,4,10,4,11,4,12,4,13,4,14,4,15,4,16,4,
17,4,18,4,-999
1000 REM **** SCREEN CHECK ****
1010 IF SCR=N1 THEN GOLD=N5:GAS=N2:ROC
KS=N2:DIF=N9
1020 IF SCR=N2 THEN GOLD=N7:GAS=N3:ROC
KS=N4:DIF=N8
1030 IF SCR=N3 THEN GOLD=N9:GAS=N5:ROC
KS=N6:DIF=N7
1040 IF SCR=N4 THEN GOLD=N10+N3:GAS=N7
:ROCKS=N8:DIF=N6
1050 IF SCR=N5 THEN GOLD=N10+N3:GAS=N9
:ROCKS=N6:DIF=N5
1060 IF SCR=N6 THEN GOLD=N10+N3:GAS=N1
0+N1:ROCKS=N5:DIF=N4
1070 IF SCR=N7 THEN GOLD=N10*N2:GAS=N2
:ROCKS=N2:DIF=N3
1080 IF SCR=N8 THEN GOLD=N5:GAS=N10+N5
:ROCKS=N7:DIF=N2
1090 IF SCR>=N9 THEN GOLD=N10+N3:GAS=N
9:ROCKS=N8:DIF=N1
1100 RETURN
1110 RESTORE 1140
1120 READ A:IF A=256 THEN SOUND N3,N0,
N0,N0:RETURN
1130 SOUND N3,A,N10,N8:FOR T=N1 TO N10
:NEXT T:GOTO 1120
1140 DATA 243,243,243,243,243,243,230,
230,230,230,243,243,243,243,243,256
1150 FOR T=N0 TO 23:PLOT N0,T:DRAWTO 1
9,T:NEXT T:POKE 756,224
1160 POSITION N5,N3:? #6;"GAME OVER"
1170 POSITION N1,N5:? #6;"GOLD §";SCOR
E
```

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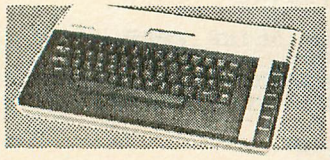

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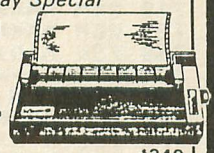

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CIRCLE #147 ON READER SERVICE CARD


```
1180 POSITION N2,N8:? #6;"levels compl
eted"
1190 POSITION N9,N9:? #6;LEVEL
1200 POSITION N5,12:? #6;"press fire"
1210 POSITION N3,14:? #6;"TO PLAY AGAI
N"
1220 IF  NOT STRIG(N0) THEN POKE 106,P
EEK(106)+N2:GOTO 610
1230 GOTO 1220
1240 GRAPHICS 2+16:SETCOLOR 4,9,2:SETC
OLOR 1,15,8
1250 POSITION 4,4:? #6;"MINER JACK"
1260 POSITION 4,6:? #6;"CREATED BY"
1270 POSITION 2,8:? #6;"RANDY  SCHULZE
"
1280 FOR Z=1 TO 50:A=PEEK(708)
1290 POKE 708,PEEK(711):FOR T=1 TO 5:N
EXT T:POKE 711,PEEK(710):FOR T=1 TO 5:
NEXT T:POKE 710,PEEK(709)
1300 FOR T=1 TO 5:NEXT T:POKE 709,A:NE
XT Z:GOTO 610
```

## CHECKSUM DATA.

*(see page 20)*

```
100 DATA 586,56,431,308,598,89,962,837
,903,244,72,72,589,922,266,6935
250 DATA 920,993,990,607,876,450,703,3
23,120,813,507,89,502,509,520,8922
400 DATA 815,929,859,671,29,934,118,12
2,888,449,436,837,134,580,142,7943
550 DATA 189,464,887,121,375,709,581,2
34,90,369,225,731,295,8,893,6171
700 DATA 212,154,684,911,658,889,743,6
74,621,733,136,418,510,644,838,8825
850 DATA 690,790,682,591,534,689,173,4
67,359,537,675,246,1,182,225,6841
1000 DATA 944,569,578,589,222,225,771,
193,245,519,782,175,418,979,723,7932
1150 DATA 999,561,274,766,928,435,720,
335,711,430,385,341,171,828,241,8125
1300 DATA 611,611
```


Next issue:

**GRAPHICS**

*Don't miss it!*

# No More Key Click

16K Disk

by Doron Gartner

When I finally got a look at one of the new XL computers, the first thing that appealed to me was the key click toggle. I do a lot of typing on my 800, and the click seems to slow me down, as well as irritate me. At first, I thought that the only way to get rid of it was to just yank the internal speaker right out, but that really isn't necessary. I pulled out the O.S. source code and saw that it was possible to move a little bit of the Operating System into RAM, where it could be changed. Then I changed the CIO vectors to point to my new routines.

I had a little trouble finding a spot for the routines, so I decided to put them right after DOS. The only problem is that the DOS copying function will overwrite this area of RAM. If you have an assembler, you can easily change the location by changing the address for KGETC2 in the source listing, which is the beginning of memory used for the program.

You will notice that, when you hit SYSTEM RESET, the click is gone. That is because I added a system reset trap. To do this in your own programs, do the following steps:

1. First, POKE BOOT? (location 9) with three to tell it that there was both a successful disk and cassette boot.

2. POKE the address (low, hi) of routine into CASINI(2,3). Remember to re-do step one within this routine, so that it will work when you press SYSTEM RESET again. At the end of the routine, put a RTS to return.

When SYSTEM RESET is pressed, the routine is run, and then DOS is re-initialized. □

BASIC listing.

```
100 REM NO KEY CLICK by Doron Gartner
110 REM
120 OPEN #1,8,0,"D:AUTORUN.SYS"
130 FOR I=1 TO 165:READ A:PUT #1,A
140 NEXT I:CLOSE #1:END
200 DATA 255,255,59,53,211,53,76,94,53
,251,243,51,246,155,52,163,246,51,246,
60,246,76,228,243,0
210 DATA 51,246,51,246,4,52,60,246,51,
246,60,246,76,228,243,0,162,156,189,22
0,246,157,255,51,202
220 DATA 208,247,169,234,141,30,52,141
,31,52,141,32,52,169,0,141,63,52,169,5
2,141,64,52,169,33
230 DATA 141,137,52,169,52,141,138,52,
162,159,189,61,246,157,155,52,202,208,
247,169,5,141,175,52,169
240 DATA 52,141,176,52,169,174,141,202
,52,169,52,141,203,52,169,212,141,231,
2,169,53,141,232,2,165
250 DATA 9,9,2,133,9,169,183,133,2,169
,53,133,3,169,62,141,33,3,169,53,141,3
4,3,169,78
260 DATA 141,39,3,169,53,141,40,3,96,2
24,2,225,2,94,53
```

•

CHECKSUM DATA.

(see page 20)

```
100 DATA 250,77,274,527,300,773,937,84
4,511,13,886,769,6161
```

Assembly language listing.

```
; No more key click!
; by Doran Gartner
;
; for Atari DOS 2.0
;
ROM.KEY   =    $F6DD
ROM.LINE  =    $F63E
KGETC2    =    $3400
KGETCH    =    KGETC2+5
EGETCH    =    KGETC2+$9C
KGETC3    =    KGETC2+33
EGETC1    =    EGETCH+18
NOCLICK   =    KGETC2+30
MEMLO     =    $02E7
CASINI    =    $02
BOOT?     =    $09
;
          *=   KGETC2+$013B
          JMP  BEGIN
;
;
SCREEN.VECTOR
          .BYTE $FB,$F3
          .BYTE $33,$F6
          .WORD EGETCH-1
          .BYTE $A3,$F6
          .BYTE $33,$F6
          .BYTE $3C,$F6
          .BYTE $4C,$E4,$F3
          .BYTE 0
;
KEYBOARD.VECTOR
          .BYTE $33,$F6
          .BYTE $33,$F6
          .WORD KGETCH-1
          .BYTE $3C,$F6
          .BYTE $33,$F6
          .BYTE $3C,$F6
          .BYTE $4C,$E4,$F3
          .BYTE 0
;
; get kgetch out of rom
;      (156 bytes)
;
BEGIN     LDX #156
LOOP      LDA ROM.KEY-1,X
          STA KGETC2-1,X
          DEX
          BNE LOOP
;
; now, for some changes
;
          LDA #$EA     ;put NOP's
          STA NOCLICK  ;instead of
          STA NOCLICK+1 ;JSR CLICK
          STA NOCLICK+2
;
          LDA # <KGETC2 ;change JMP's
          STA KGETC2+63 ;within KGET
          LDA # >KGETC2
          STA KGETC2+64
;
          LDA # <KGETC3
          STA KGETC2+137
          LDA # >KGETC3
          STA KGETC2+138
;
;  get egetch out of rom
;       (159 bytes)
;
          LDX #159
LOOP2     LDA ROM.LINE-1,X
          STA EGETCH-1,X
          DEX
          BNE LOOP2
;
;   more changes!!
;
          LDA # <KGETCH ;change JMP's
          STA EGETCH+19 ;within EGETCH
          LDA # >KGETCH
          STA EGETCH+20
          LDA # <EGETC1
          STA EGETCH+46
          LDA # >EGETC1
          STA EGETCH+47
          LDA # <NEWLO ;set memlo pntr
          STA MEMLO    ;past handler so
          LDA # >NEWLO ;BASIC won't
          STA MEMLO+1 ;clobber it!
          LDA BOOT?
          ORA #2
          STA BOOT?    ;flag cas boot
;
; tell hatabs about vectors
;
HATAB     LDA # <HATAB
          STA CASINI
          LDA # >HATAB
          STA CASINI+1
          LDA # <SCREEN.VECTOR
          STA $0321
          LDA # >SCREEN.VECTOR
          STA $0322
          LDA # <KEYBOARD.VECTOR
          STA $0327
          LDA # >KEYBOARD.VECTOR
          STA $0328
          RTS
;
NEWLO     =    *
;
          *=   $02E0
          .WORD BEGIN
          .END
```

●

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CIRCLE #119 ON READER SERVICE CARD.

# The Third ANALOG Computing Guide to Atari Computer Publications

by Lee Pappas

Many Atari computer-oriented books have been released since our last listing in April of 1984 (issue 18). **ANALOG Computing** will continue to inform its readers of recently-published books every month, in the **New Products** section. Also, examine the July/August 1983 issue (issue 12), which contained our first listing—four pages of compatible books.

*PECK, ROBERT A.* **ADVANCED ATARI BASIC TUTORIAL.** 174pp. HOWARD SAMS84 (0-672-22067-9) $11.95

A follow-up to the **ATARI BASIC TUTORIAL**, this book continues coverage of Atari's BASIC with concentrated use of the Disk Operating System (DOS), database programming and graphic applications. Additional chapters cover advanced string handling, sorting and screen handling. Includes many program examples and practical solutions.

*CHASIN, MARK.* **ASSEMBLY LANGUAGE PROGRAMMING FOR THE ATARI COMPUTERS.** 304pp. MCGRAW-HILL84. (0-07-010679-7) $15.95 (approx.)

This hefty, large-format paperback follows machine language programming from beginning to end, with full coverage of the 6502 instruction set. Nomenclature, addressing techniques, display list and interrupts, graphics and sound are all explained in detail, along with many of the other specialties inherent in the Atari home computers.

One chapter covers the six popular assemblers for the Atari: the Atari Assembler Editor Cartridge, the Atari Macro Assembler, MAC/65, the SynAssembler, Edit 6502 from LJK and the Macro Assembler/Text Editor from Eastern House. Another covers using machine language subroutines in Atari BASIC, fine scrolling and Atari hardware.

*COLLINS, JOSEPH W.* **ATARI COLOR GRAPHICS.** 202pp. ARRAYS INC84 (0-912003-17-7) $12.95

This book, dubbed "A Beginner's Workbook," thoroughly covers all of the graphics modes, 1 to 15. Additional information is given to GTIA-chip or XL owners, plus non-GTIA and non-XL owners. Short programs abound, explaining the individual modes in detail. Many have photos included to show what your typing should resemble when the programs are run. How to use colors, the text window and graphics mode 0 are also extensively explored.

*D'IGNAZIO, FRED.* **THE ATARI PLAYGROUND.** 122pp. HAYDON83 (0-8104-5770-9) $9.95

Many of the twenty-three programs contained in this "type and run" book were written by children, which is the age bracket it's designed for. The BASIC listings cover numbers, the alphabet, words, music, faces, colors, drawing, imagination, hand-eye and knowledge.

Most of the listings are fairly short, and the type used throughout the book is *large*, making reading and typing a simple chore. Each program includes text—for parents and teachers—describing what the program does and its benefits. For kids, there are typing hints, artwork, highlights and some explanations of how the programs work. At $19.95, the book is available with a cassette of all twenty-three programs.

*SHNEIDERMAN, BEN.* **LET'S LEARN BASIC.** 194pp. LITTLE,BROWN84 (0-316-78722-1) $8.95

*Let's Learn BASIC: A kids' introduction to BASIC programming on Atari Home Computers* is oriented toward children 8 to 14 years old (3rd through 9th graders). Presented in a logical order, designed to make sense to the reader, this book gets the novice involved with computer-arithmetic, printing functions and decision making (i.e., IF/GOTO). Many program demos and illustrations.

*ZUANICH, MARGARET ANN* and *LIPSCOMB, SUSAN DRAKE.* **BASIC FUN WITH GRAPHICS: THE ATARI WAY.** 128pp. AVON83 (0-380-85050-8) $3.95

A small paperback containing many short programs which allow you to create elementary pictures and shapes in BASIC. The first section shows how to "draw," using just the alpha-numeric capabilities of the computer (a throwback to the old computer days). The more interesting programs fiddle with geometry and SIN/COS functions, enabling you to produce some fascinating images. Dozens of black and white drawings are included, along with several color photos.

**THE BLUE BOOK FOR THE ATARI COMPUTER.** 320pp. WIDL Video Pub. (684-17921-0) $17.95

Over 940 software and hardware items in all categories are listed here, with more than 52 different categories for programs. The complete indexing system will assist you in finding a particular product. Descriptions accompany all listings, and a section is included which gives the addresses and phone numbers of every company mentioned in the book.

*GOODE, PETER.* **GETTING STARTED WITH THE ATARI 600XL.** 140pp. Dist. by DAVID & CHARLES INC., North Pomfret, VT 05053 (0-9465-7614-9) $12.95

The second page of Chapter 1 instantly starts you on your way into using and programming your 600XL. The book is filled with demos and examples, illustrating uses such as joystick routines, strings, graphics and many of the general BASIC commands, This is all followed by a glossary and error code listing.

*PECK, ROBERT A.* **ATARI BASIC TUTORIAL.** 220pp. HOWARD SAMS83 (0-672-22066-0) $12.95

This book treats the Atari computer as a serious tool and starts—from the ground up—teaching BASIC and general Atari operations. Introductions to DOS, string handling, data functions, graphics and sound are all covered, along with programming techniques. Short programs which utilize the appropriate statements are included.

*D'IGNAZIO, FRED.* **THE ATARI WONDERLAND.** 139pp. HAYDON83 (0-8104-5771-7) $9.95

By the author of **The Atari Playground**, this follow-up book continues in the same style, with twenty-three new programs for youngsters. The same topics are covered, except for alphabet and drawing, which have been replaced with two programs teaching how to count from 1 to 10 in Spanish and French. Other programs include: Greater than What?, the Pied Piper, Make Up a Song, Al's Tour of the States, Where Do You Live? and Book Report.

*RUGG, TOM; FELDMAN, PHIL* and *BARRY, TIMOTHY.* **32 BASIC PROGRAMS FOR THE ATARI COMPUTER.** 274pp. DILITHIUM84 (0-88056-084-3) $19.95

As the title said, this book contains 32 BASIC listings designed to run on every model Atari computer. Unlike most other program listing books, this one covers using the program, shows you a sample run as it would appear on-screen and has a "how to" section for easy modifications. Also shown are the main routines (giving the BASIC line numbers and their functions) and a variable list, followed by a list of suggested projects.

Program titles include: Roadrace, Wari and Jot—all games; Graph, Stats and Curve—math-solving listings; Kaleido, Sparkle and Walloons—graphic displays; and Flash, Vocab and Metric Numbers—educational. Other sections cover applications and miscellaneous programs.

*KNIGHT, TIMOTHY O.* **HOW TO EXCEL ON YOUR ATARI 600XL AND 800XL.** 144pp. MCGRAW-HILL84, $9.95 (approx.)

One of the few books written exclusively for the XL line, this book is a good replacement for the manual that never came with your 600XL or 800XL. Chapters cover setting up and familiarizing yourself with the computer, using the AtariWriter word processor, graphics, sound and music. Also covered are the use of the computer in the home, initial programming techniques and brief descriptions of Atari-compatible peripherals.

*GOODE, PETER.* **THE ATARI 600XL PROGRAM BOOK.** 160pp. Dist. by DAVID & CHARLES INC., North Pomfret, VT 05053 (0-9465-7611-4) $12.95

This book from Great Britain contains programs which can be run on the 600XL's 16K standard memory. Games such as Wall Dodge, Egg Catcher, Meteoroid Storm and Robot Island are listed, as well as programs for general use, like Bar Chart and Cataloger. Educational listings are also included. Though the programs are rather simplistic, they'll start you on your way. Thirty-five programs are fully listed.

*Note: the numbers given in parentheses in these listings are ISBNs which, when given to a bookstore, will aid in locating or ordering a book.*

*(continued from page 9)*

**Balldrop modified.**

Here is a modification of **Balldrop** (**ANALOG Computing**, issue 22) that labels the marble bins, and allows the user to choose the number of balls to be dispensed. In addition, a reRUN prompt is presented at the end of the run. The modification lines are compatible with both the BASIC and the version that uses a machine language subroutine.

```
20 POKE 82,0:POKE 710,0:PO
KE 752,1:PRINT "{ BALLDROP
}"
30 DIM C(37),NUM$(7),Q$(1)
50 PRINT "NUMBER OF BALLS:
   ";:INPUT MARBLES:PRIN
T "{↑}";
165 POSITION 0,23:? " A B
C D E F G H I J K L M N O
P Q R S";
211 POKE 77,0
360 REM
394 SOUND 0,0,0,0:POSITION
 24,0:PRINT "RERUN (Y/N)";
396 INPUT Q$:IF Q$="Y" THE
N RUN
```

Ronald Starkey
Green Bay, WI

---

**Another BASIC Bug Bug.**

I just read **Another BASIC Bug** by R.T. Dolbeare in your October issue (23) and feel I can clear up some misconceptions raised, offering a more satisfactory remedy.

The author says he has found a "previously-undocumented error in Atari BASIC," which isn't the case. The bug he describes is not caused by the VAL statement, but is simply a manifestation of a problem with the GET statement—which is described by Bill Wilkinson in the *Atari BASIC Source Book*, page 277.

The error is caused by the failure of GET to reinitialize INBUFF, the BASIC buffer pointer located at $F3. VAL changes INBUFF so that it points to the string whose value is to be taken. To GET a byte, BASIC calls an I/O routine which uses the contents of INBUFF as CIO buffer address. The failure to reset INBUFF to point to the general purpose BASIC buffer at $580 then causes the byte gotten to be placed in the string that VAL pointed to, instead of in the safe buffer area.

To remedy this, Wilkinson suggests executing a statement known to reset INBUFF, like DUMMY$ =STR(0) or PRINTing a number, before executing GET. A better solution, which won't require a dummy string or upsetting the screen display, is to initialize INBUFF via the following statement:

```
X=USR(ADR("hL0Z"))
```

This, in effect, JSRs to the INTLBF routine at $DA51 in the floating point package ROM, precisely the step which GET omits.

Incidentally, the INPUT statement doesn't cause this bug, since it does properly initialize INBUFF. However, a problem will occur if you are using page 6 for a machine language subroutine and then INPUT (from disk or cassette) a string longer than 128 bytes.

Since the string is stored starting at $580, the excess will spill over into page 6, wiping out the code you had stored there. The second half of page 6 ($680-$6FF) is still safe, because INPUTs are limited to 255 bytes plus an EOL.

Trent Dudley
Littleton, CO

---

**More bug solutions.**

I was thrilled to read R.T. Dolbeare's article on a **BASIC Bug**. I thought I was going crazy!

The problem seems to be in the GET which follows a VAL. The GET ought to be in a subroutine, and the IOCB used ought to be OPENed just before using GET, closing just after the GET is done. This seems to avoid the noted bug.

Note the changes to the program listed in the article. This solves the problem and conforms to good programming practice.

```
100 OPEN #1,4,0,"K:"
110 DIM S$(8)
120 S$="84-06,30"
130 YEAR=VAL(S$)
140 ? "BEFORE GET, S$=";S$
150 ? "HIT ANY KEY":GET #1
,D
160 ? "AFTER GET, S$=";S$
170 END
```

The program should read:

```
110 DIM S$(8)
120 S$="84-06,30"
130 YEAR=VAL(S$)
140 ? "BEFORE GET, S$=";S$
150 ? "HIT ANY KEY":OPEN #
1,4,0,"K:":GET #1,D:CLOSE
#1
160 ? "AFTER GET, S$=";S$
170 END
```

Sincerely,
Lee Brilliant
Kaysville, UT

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CIRCLE #151 ON READER SERVICE CARD

**FINANCIAL COOKBOOK**
**ELECTRONIC ARTS**
**2755 Campus Drive**
**San Mateo, CA 94403**
**(413) 571-7171**
**48K $50.00**

by Arthur Leyenberger

Electronic Arts is well known for their excellent entertainment software. However, their first entry into the home application category, **Cut & Paste**, left quite a bit to be desired in terms of power and features. That's why, when I first received **Financial Cookbook**, I was less than eager to use it, let alone take the time to review the program. So it sat on my shelf for a couple of weeks, until one day my neighbor Mike mentioned that he was going to refinance the mortgage on his house.

Being a good neighbor and wanting to show Mike that I used my Atari for more than just playing games, I faintly remembered that **Financial Cookbook** had a recipe for home loan refinancing. So I took it off the shelf, blew the dust off the cover and loaded the program. To say I was pleasantly surprised would be an understatement.

### Clarity and helpful advice.

After selecting Recipe #25: Refinancing Your Home, I was asked to enter the information shown in Table 1. Most of the questions were straightforward enough. The only question I was unsure of was "years to analyze." But I figured it was essentially asking me how long Mike planned to stay in his current home.

```
25 Refinancing Your Home

Shows the impact of refinancing a loan

Original mortgage amount $ 75000
      Length of mortgage   30
  Mortgage interest rate % 14.5
      Years paid on loan   5
          Payoff penalty $ 0
      Amount of new loan $ 75000
      Length of mortgage   30
  Mortgage interest rate % 13
              Points paid % 1
     Other closing costs $ 775
        Years to analyze   5
  Estimated resale value $ 95000
    Interest rate earned % 11
     Compounding periods   365
       Marginal tax rate % 22
```

Table 1.

After I told the program to calculate, the results appeared (see Table 2), faster than you could say "Certified Public Accountant." Best of all, the program gave us advice—*BEST TO REFINANCE*.

```
BEST TO REFINANCE

-------------PRESENT LOAN-----------
Old mortgage balance ..... $ 73937
Total cash payments ..... $ 55105
Total tax savings ..... $ 11642
Total expense, net ..... $ 43463
Pres value net expenses ... $ 35485
Pres value future equity .. $ 15063
Pres value costs-equity ... $ 20423

--------------NEW LOAN------------
Cash avail from refinance . $  -462
Total cash payments ..... $ 49779
Total tax savings ..... $ 10800
Total expense, net ..... $ 38979
Pres value net expenses ... $ 31816
Pres value future equity .. $ 13890
Pres val costs-cash-equity  $ 18387
```

Table 2.

By trial and error, we figured out that three years would be the cutover point, at which time refinancing would pay for itself. Ideally, it would be useful if this recipe would automatically display how many years it would take for the refinancing to pay off.

Some of the other mortgage-related recipes include: monthly and yearly mortgage schedules, variable rate and payment mortgages, variable rate and fixed payment mortgages, interest-only second mortgages, balloon payment mortgages and retiring (paying off) your mortgage early.

I found the recipes for IRAs to be especially useful. I was able to figure out what the future value of my IRA investments would be. If I deposited $4000 per year (the maximum allowed for my spouse and me) for 25 years at 13% interest, assuming that inflation would be 6% per year, I would have over $714,000 (Recipe #14: An IRA's Future Value, see Table 3).

I also learned that, in terms of buying power, that amount is roughly equivalent to about $166,000 in today's money. That really puts it in perspective. Then I used another recipe to determine that, if I withdrew $5000 per month, the amount saved in my IRA would last just over 19 years (Recipe #15: Living from an IRA, see Table 4).

### What it will do.

**Financial Cookbook** contains thirty-two recipes or formulas for quickly determining such things as returns on investments, effective tax shelters and IRAs, the effects of inflation, mortgage calculations and tax rates. Each recipe asks the user to enter certain variables and makes calculations based on these.

All of these calculations are done without the need to build complicated models, as is required when using a spreadsheet. Also, knowledge of complicated financial formulas is not required to get results quickly and easily. The ability to instantly recalculate based

```
14 An IRA's Future Value

Finds the future value of regular IRA
deposits

          Yearly deposit $ 4000
        Years to analyze   25
    Initial IRA balance $ 0
  Interest rate earned % 13
   Compounding periods   365
        Inflation rate % 6

Future balance ..... $714005

YR  DEPOSITED   BALANCE    BUY PWR
 1    $  4000   $  4000    $  3774
 2    $  8000   $  8555    $  7614
 3    $ 12000   $ 13743    $ 11539
 4    $ 16000   $ 19650    $ 15565
 5    $ 20000   $ 26378    $ 19711
 6    $ 24000   $ 34039    $ 23996
 7    $ 28000   $ 42764    $ 28440
 8    $ 32000   $ 52700    $ 33064
 9    $ 36000   $ 64015    $ 37890
10    $ 40000   $ 76900    $ 42941
11    $ 44000   $ 91574    $ 48240
12    $ 48000   $108285    $ 53814
13    $ 52000   $127316    $ 59691
14    $ 56000   $148988    $ 65897
15    $ 60000   $173668    $ 72466
16    $ 64000   $201774    $ 79427
17    $ 68000   $233781    $ 86818
18    $ 72000   $270231    $ 94674
19    $ 76000   $311740    $103034
20    $ 80000   $359011    $111941
21    $ 84000   $412843    $121440
22    $ 88000   $474147    $131578
23    $ 92000   $543961    $142407
24    $ 96000   $623465    $153982
25    $100000   $714005    $166362
      -------   -------    -------
TOT   $100000   $714005    $166362
```

Table 3.

on changing one value, such as interest rate earned or expected inflation rate, really makes the program useful for answering those "what if" types of questions that invariably occur.

Some entries—like interest rate, marginal tax rate and expected inflation—appear in nearly every recipe. To save you the drudgery of having to retype this information each time you use a new recipe, **Financial Cookbook** has a profile command that lets you enter and save these numbers for future use. Once you enter your data with the profile command, it is entered automatically whenever a recipe calls for it. You can even save this data to your work disk. You can also save a copy of a filled-in recipe to your document disk. The document disk uses the same format as that of **Cut & Paste**, but, unfortunately, C&P cannot be used to edit the saved **Financial Cookbook** documents.

```
15 Living from an IRA

Finds the effect of withdrawing
constant buying power monthly

     Initial IRA balance $ 714005
      Monthly withdrawal $ 5000
          Inflation rate % 6
    Interest rate earned % 11
     Compounding periods   365
  Tax rate at retirement % 15

Money will last 19 years and 6 + mos.

Total withdrawn ..... $ 2125K
Interest earned ..... $ 1411K
Taxes paid ..... $318783

     ------WITHDRAWALS------
YR  MONTHLY PRE-TAX AFT-TAX BALANCE
 1  $  5000 $ 60000 $ 51000 $733881
 2  $  5300 $ 63600 $ 54060 $752280
 3  $  5618 $ 67416 $ 57304 $768803
 4  $  5955 $ 71461 $ 60742 $782990
 5  $  6312 $ 75749 $ 64386 $794316
 6  $  6691 $ 80294 $ 68250 $802175
 7  $  7093 $ 85111 $ 72344 $805879
 8  $  7518 $ 90218 $ 76685 $804641
 9  $  7969 $ 95631 $ 81286 $797563
10  $  8447 $101369 $ 86163 $783624
11  $  8954 $107451 $ 91333 $761665
12  $  9491 $113898 $ 96813 $730369
13  $ 10061 $120732 $102622 $688244
14  $ 10665 $127976 $108779 $633599
15  $ 11305 $135654 $115306 $564522
16  $ 11983 $143793 $122224 $478850
17  $ 12702 $152421 $129558 $374139
18  $ 13464 $161566 $137331 $247632
19  $ 14272 $171260 $145571 $ 96216
20  $ 15128 $ 99621 $ 84678 $     0
```

Table 4.

Sometimes the results of a recipe's calculations exceed the 20-line screen length. When this occurs, the display automatically scrolls down as the answer table is generated. When the output is finished, the cursor returns back to the top line of the recipe. You can then use the cursor control keys to scroll through the entire input and output of the recipe.

There is also a print command to let you send your input data and subsequent output to your printer. This is how Tables 1 and 2 were created. The print command tells your printer to print everything from the title line of the recipe to the last line of the table. If the amount of the output is greater than 66 lines, you must use continuous-form paper in your printer to accommodate it. Only one printer option is available, and it lets you choose to either send or not send line feeds to your printer.

*(continued on page 86)*

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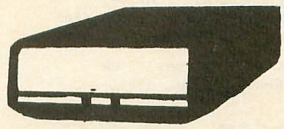

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The documentation included with **Financial Cookbook** is probably the best yet seen from Electronic Arts—and one of the best I've *ever* seen for any software running on an Atari. A complete instruction manual containing a tutorial, recipe instructions and index is provided. The manual also gives good, understandable explanations of financial and tax issues, plus a comprehensive glossary.

**The results — a superb menu.**

**Financial Cookbook** was written by Stan Trost with members of the Electronic Arts software staff. The program is suitable for anyone who makes decisions about personal money matters. Given that money is important to all of us, **Financial Cookbook** is one product that can be used by just about everyone. It should pay for itself the first time you use it to make a decision about your money. . .especially with its petty cash price of only $50.00.

Turning your Atari computer into a financial advisor is both informative and fun. I highly recommend **Financial Cookbook**. □

# Adding BASIC Function Keys

16K Cassette or Disk

by Stephen Prokopchuk

One day while typing out a long program, I realized how often one types the same BASIC key words over and over again. If these words could be printed out by pressing a single key, I reasoned, much time could be saved.

The resulting program will define CTRL 4-0 and SHIFT+CTRL 4-0 as **Function Keys**. It does so via the seldom-used POKEY keyboard interrupt vector VKEYBD at memory location 520-521 ($208-$209 hex). Whenever a key is pressed, the computer stops whatever it is doing and jumps to the keyboard scan routine normally located at 65470 ($FFBE hex). This interrupt has been moved to our program, **Function Keys**, which checks to see if any of these keys has been pressed.

### How to use it.

Two programs are presented here, one in BASIC and one in assembly language. The assembly language program is for more advanced users and does not have to be typed into the computer.

After running the BASIC program for **Function Keys**, your computer will give brief instructions and show the default setting (see Table 1) for function key #1 (LOAD), asking for your setting. If you wish this key to have the default assignment, simply push RETURN.

If you wish to assign your own phrase to that key, type the phrase and then press RETURN. Keep in mind that the length of the phrase must not exceed seven letters. The computer will prompt you in this fashion for all of the keys capable of function assignments.

**Table 1.**

| Command | Function |
|---|---|
| CTRL-4 | LOAD " |
| CTRL-5 | SAVE " |
| CTRL-6 | LIST |
| CTRL-7 | RUN |
| CTRL-8 | POKE |
| CTRL-9 | PEEK( |
| CTRL-0 | DATA |
| SHIFT+CTRL-4 | PLOT |
| SHIFT+CTRL-5 | DR. (DRAWTO) |
| SHIFT+CTRL-6 | LOC. (LOCATE) |
| SHIFT+CTRL-7 | POS. (POSITION) |
| SHIFT+CTRL-8 | COLOR) |
| SHIFT+CTRL-9 | SE. (SETCOLOR) |
| SHIFT+CTRL-0 | GR. (GRAPHICS) |

When BASIC displays *READY*, your **Function Keys** are all defined. Try pressing CTRL-4 to CTRL-0 or

SHIFT-CTRL-4 to 0 and see the words you have defined appear on the screen.

Keep in mind that pressing SYSTEM RESET will disable the **Function Keys**. To re-enable them, type:

```
PRINT USR(1536)
```

Also, press RESET before re-running the BASIC program, otherwise **Function Keys** will print *FUNCTION ALREADY IMPLEMENTED.*

### Go to it!

This program is only a small example of what could be done using the keyboard interrupt. The keypad could be reconfigured in hundreds of ways, including moving the cursor control keys, or even setting it up in a Dvorak layout. Have fun—experiment! □

### BASIC listing.

```
10 GRAPHICS 0:POKE 752,1:SETCOLOR 2,0,
0:? "FUNCTION KEY DRIVER":? "BY STEPHE
N PROKOPCHUK":POKE 752,0
15 IF PEEK(520)+PEEK(521)*256=1586 THE
N ? "FUNCTION ALREADY IMPLEMENTED":END
20 FOR I=1536 TO 1679:READ A:C=C+A:POK
E I,A:NEXT I
25 IF C<>17026 THEN ? "ERROR IN DATA":
END
30 ? :? " THIS PROGRAM WILL DEFINE CTR
L 4 - 0":? "AND SHIFT+CTRL 4-0 AS PHRA
SES WHICH"
35 ? "YOU MAY ENTER. THESE PHRASES CAN
 BE"
40 ? "CALLED AT ANY TIME BY SIMPLY PUS
HING":? "THE APPROPRIATE KEY."
50 DIM A$(16),B$(16)
60 FOR I=1 TO 14
70 ? :? "FUNCTION KEY #";I;" - CTRL ";
:IF I<8 THEN ? CHR$(48+I*(I<>7)+3*(I<>
7))
75 IF I>7 THEN ? "+ SHIFT ";CHR$(48+(I
-7)*(I-7<>7)+3*(I-7<>7))
80 READ A$:? "DEFAULT SETTING IS [";A$
;"]"
90 ? "YOUR PHRASE";:INPUT B$
100 IF LEN(B$)>7 THEN ? "PHRASE IS TOO
 LONG.":GOTO 90
110 IF B$="" THEN B$=A$
120 FOR J=1 TO LEN(B$):POKE 1680+(I-1)
*8+J-1,ASC(B$(J)):NEXT J
130 POKE 1680+(I-1)*8+J-1,0:NEXT I
140 ? :? "PROCESS IS COMPLETE."
170 X=USR(1536):END
1536 DATA 104,173,8,2,141,82,6,173
1544 DATA 9,2,141,83,6,169,50,141
1552 DATA 8,2,169,6,141,9,2,173
1560 DATA 33,3,133,207,173,34,3,133
1568 DATA 208,160,6,177,207,141,123,6
1576 DATA 200,177,207,141,124,6,238,12
3
1584 DATA 6,96,165,66,208,27,160,0
1592 DATA 185,137,6,205,9,210,240,25
1600 DATA 9,64,205,9,210,240,13,200
1608 DATA 192,7,208,236,169,0,141,241
1616 DATA 2,76,190,255,152,24,105,7
1624 DATA 168,173,241,2,208,243,152,10
1632 DATA 10,10,24,105,144,133,203,169
1640 DATA 6,133,204,160,0,177,203,56
1648 DATA 233,32,133,93,177,203,240,10
1656 DATA 132,206,32,164,246,164,206,2
00
1664 DATA 16,242,169,1,141,241,2,104
1672 DATA 64,152,157,155,179,181,176,1
78
2000 DATA LOAD ",SAVE ",LIST ,RUN ,POK
E ,PEEK(,DATA ,PLOT ,DR. ,LOC. ,POS. ,
COLOR ,SE. ,GR. ,
```

### CHECKSUM DATA.

*(see page 20)*

```
10 DATA 294,710,311,265,754,735,874,19
7,237,630,54,493,961,548,688,7751
120 DATA 391,367,475,574,888,707,638,7
52,228,267,963,966,743,223,800,8982
1624 DATA 47,33,960,53,518,953,570,236
,3370
```

•

### Assembly language listing.

```
;************************
;* FUNCTION KEY DRIVER *
;*By Stephen Prokopchuk*
;*Written for THE ATARI*
;*   MACRO ASSEMBLER   *
;************************
 ORG $600
;
;SYSTEM EQUATES
;
CIO         = $E456
ICCOM       = $342
ICBADR      = $344
ICBLEN      = $348
ICAUX1      = $34A
ICAUX2      = $34B
VKEYDB      = $208
KEYDEL      = $2F1
KBCODE      = $D209
OLDADR      = $5E
OLDCHR      = $5D
COLCRS      = $55
ROWCRS      = $54
CRITIC      = $42
EHADS       = 801
;
;CIO HANDLER VALUES
;
COPN        = 3
CCLOSE      = 12
CPBINR      = 11
CGTXTR      = 5
;
;PROGRAM EQUATES
;
KEYADR      = 203
LENGTH      = 205
YSAVE       = 206
EPADR       = 207
;
;THE PROGRAM
;
PROGRAM
 PLA                ;GET # PARAMETERS
ENTRY               ;TO SATISFY BASIC
 LDA VKEYDB         ;SAVE ORIGINAL
 STA EXIT+1         ;INTERRUPT VECTOR
 LDA VKEYDB+1
 STA EXIT+2
 LDA #LOW CHECK     ;MOVE KEYBOARD
 STA VKEYDB         ;INTERRUPT TO
 LDA #HIGH CHECK    ;POINT TO OUR
 STA VKEYDB+1       ;ROUTINE
 LDA EHADS
 STA EPADR          ;FIND EDITOR
 LDA EHADS+1        ;HANDLER TABLE
 STA EPADR+1
 LDY #6             ;FIND EDITOR "PUT"
 LDA (EPADR),Y      ;ROUTINE + MODIFY
 STA JPRINT+1       ;PROGRAM TO JSR
 INY                ;TO THIS ROUTINE
 LDA (EPADR),Y
 STA JPRINT+2
 INC JPRINT+1
 RTS                ;RETURN
CHECK
 LDA CRITIC         ;IS THIS TIME
 BNE EXIT           ;CRITICAL I/O?
```

```
 LDY #0
MLOOP
 LDA KEY,Y          ;CHECK IF KEY
 CMP KBCODE         ;PRESSED MATCHES
 BEQ PRCH2          ;OUR TABLE OF
 ORA #$40           ;FUNCTION KEYS
 CMP KBCODE         ;SHIFT+CTRL?
 BEQ PRCH1
 INY
 CPY #7
 BNE MLOOP
 LDA #0             ;NO MATCH FOUND
 STA KEYDEL         ;CLEAR DEBOUNCE
EXIT                ;CONTINUE WITH
 JMP $FFBE          ;INTERRUPT
PRCH1
 TYA
 CLC
 ADC #7
 TAY
PRCH2
 LDA KEYDEL         ;IS THIS "BOUNCE"
 BNE EXIT           ;YES - EXIT
 TYA                ;FIND ADDRESS OF
 ASL A              ;PHRASE TO PRINT
 ASL A              ;ON SCREEN.
 ASL A
 CLC
 ADC #$90
 STA KEYADR
 LDA #6
 STA KEYADR+1
 LDY #0
 LDA (KEYADR),Y     ;SAVE FIRST LETTER
 SEC                ;OF PHRASE AS
 SBC #32            ;UNDER THE CURSOR
 STA OLDCHR         ;TO STOP ERASURE
PRLOOP
 LDA (KEYADR),Y     ;GET A LETTER
 BEQ ADJPOS         ;END OF PHRASE?
 STY YSAVE          ;SAVE Y REG
JPRINT
 JSR $F6A4          ;PRINT CHARACTER
 LDY YSAVE          ;RELOAD Y REG
 INY
 BPL PRLOOP         ;DO AGAIN
ADJPOS
 LDA #1             ;SET DEBOUNCE
 STA KEYDEL
 PLA
 RTI                ;AND RETURN
;
;TABLE OF FUNCTION KEY CODES
;
KEY DB 152,157,155,179,181,176,178
;
;TABLE OF FUNCTION KEY PHRASES
;
 ORG $690
 DB 'LOAD "',0
 ORG $698
 DB 'SAVE "',0
 ORG $6A0
 DB 'LIST ',0
 ORG $6A8
 DB 'RUN ',0
 ORG $6B0
 DB 'POKE ',0
 ORG $6B8
 DB 'PEEK(',0
 ORG $6C0
 DB 'DATA ',0
 ORG $6C8
 DB 'PLOT ',0
 ORG $6D0
 DB 'DR. ',0
 ORG $6D8
 DB 'LOC. ',0
 ORG $6E0
 DB 'POS. ',0
 ORG $6E8
 DB 'COLOR ',0
 ORG $6F0
 DB 'SE. ',0
 ORG $6F8
 DB 'GR. ',0
 END ENTRY
```

# Attention Programmers!

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

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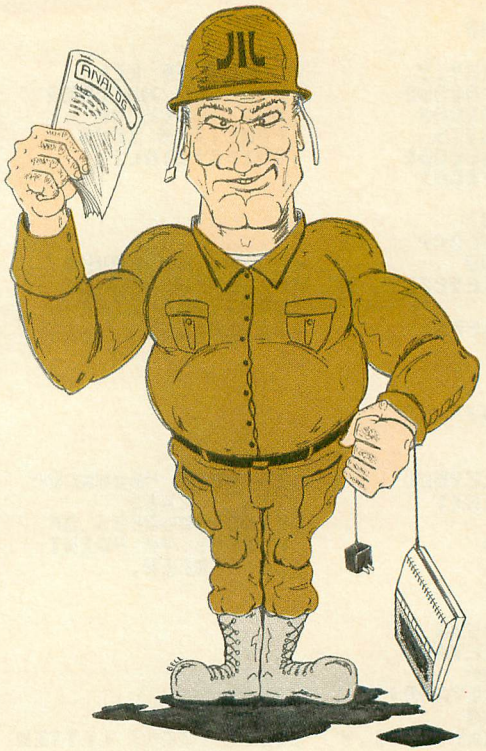
Editor, **ANALOG Computing**, P.O. Box 23, Worcester, MA 01603.

# BASIC Training




by Tom Hudson

Welcome back to **BASIC Training**, where we're in the process of writing **High Seas**, a game based on the old paper-and-pencil favorite, Battleship. So far, we've examined the overall program flow and the format we'll use to store game data in the computer. This issue, we're going to look at the routines needed for the human player: ship placement and shooting.

### Where's the fleet?

Obviously, the first routine we should think about is the human player's ship placement. After all, this must be done before the shooting starts, so let's get to it.

Before flowcharting the routine, we should think about what must be done to verify correct positioning of the player's ships.

First, the computer must ask the player to position each of the five ships (destroyer, submarine, cruiser, battleship and carrier). It's a good idea to remind the player of the length of each ship.

The actual placement of the ship can be done by simply requesting the bow and stern coordinates for each ship. In **High Seas**, the bow and stern terms are interchangeable and are merely used to find the ship's endpoints. For example, in Figure 1, the destroyer's endpoints are B1 and B2, and the battleship's endpoints are E8 and H8. Having the endpoints, the computer can easily calculate the intermediate points. This is also a "user-friendly" way to accept the ship placement data, since the player doesn't have to furnish all the coordinates of each ship.

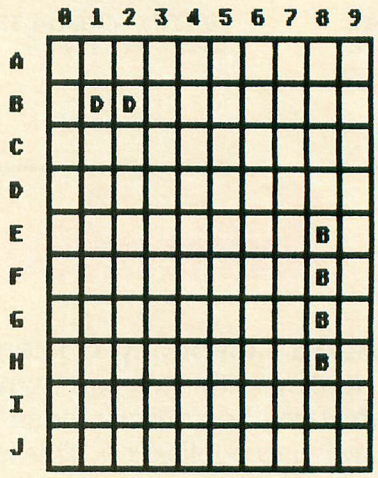



**Figure 1.**

Naturally, in order for the user to enter the coordinates easily, the computer must accept them in the letter-number format discussed last issue. The letter can range from A to J, and the number from 0 to 9. Any invalid entries must be rejected, and the user given another chance to enter them correctly.

As each ship's endpoint coordinates are entered, the computer must check to be sure the ships are placed on the grid orthagonally. That is, they can't be placed diagonally. In Figure 2, the cruiser and destroyer are placed orthagonally, but the carrier is placed diagonally. This is an invalid placement, so the computer must ask for the carrier's endpoints again.

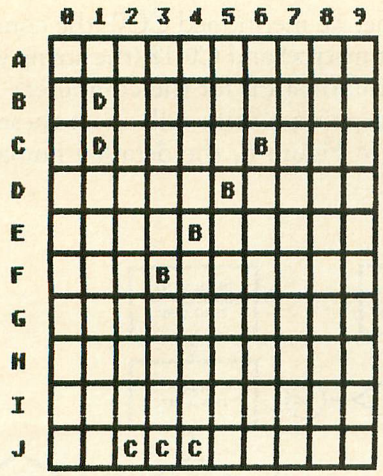



Figure 2.

The computer must also check to be sure that the ship in question will fit between the endpoints. For example, the aircraft carrier, which is five positions long, will not fit between A1 and A3, which allows only three positions. Similarly, the destroyer (two positions) won't fit correctly between coordinates D3 and F3, which are three positions long.

The ships can be placed in any configuration the human likes, but no overlaps are allowed. In Figure 3, for example, the battleship is placed from coordinate F3 to F6. If the human attempts to place the carrier from coordinate D5 to H5, it would overlap the battleship at coordinate F5. This is obviously an invalid ship placement, so the human would receive a prompt to enter the carrier's coordinates again.

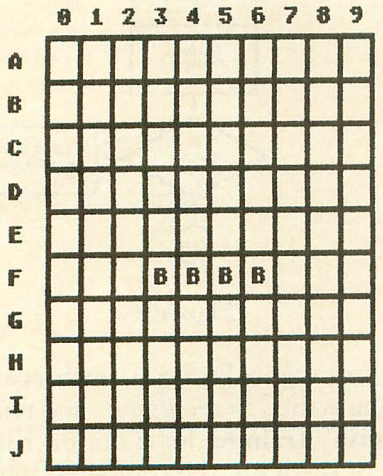



Figure 3.

As long as the ships do not overlap, there are no restrictions on ship placement. Figure 4 shows one possible setup, which is rather unorthodox—and invites disaster. The ships are so close that a near-miss on one ship will almost certainly hit another. Feel free to use such ship placements with **High Seas**; my artificial intelligence routines are equipped to take ruthless advantage of such tactical flaws.

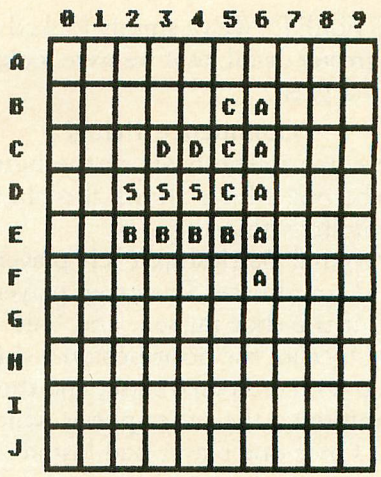



Figure 4.

Well, that takes care of the conditions we'll have to take into account when coding the human's ship placement subroutine. Figure 5 shows a detailed flowchart of the logic needed for this routine. Note that the mainline code sets certain parameters for each ship and then calls the subroutine, which accepts placement input and verifies its validity.

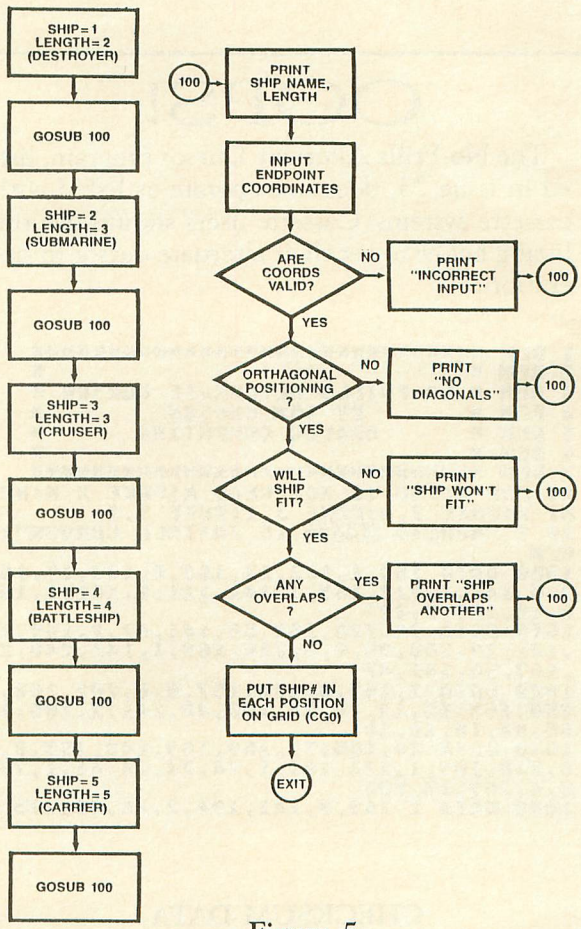



Figure 5.

If you look at **ANALOG Computing** issue 23's **BASIC Training**, you will see that the flowchart in Figure 5 was shown as a single block, labeled "SET UP

PLAYER'S FLEET." We've simply looked at the same process in greater detail, as if we were looking through a magnifying glass.

### Commence firing!

Now we come to the heart of the human player's routines, the one which allows the player to shoot at the computer's ships.

In the original Battleship, each player called out a single grid coordinate. The other player would call out "miss" if the shot missed, and "hit" if the shot hit a ship. Once all the positions on a ship had been hit, the ship was considered sunk, and the player who owned it informed the other player which ship had been sunk. Once one player had lost all of his ships, the game was over.

**High Seas** uses the same rules, except that the computer will act as referee, automatically checking for destroyed ships on both sides.

For the human player's shooting routine, there are only two important restrictions. First, the shot (given in standard letter-number format) must range from A to J in the letter portion and from 0 to 9 in the number portion. Second, the shot must be fired at a coordinate which has not been shot at before.

## OOPS!

The **No-Frills Alternate Cursor** program, listed in issue 23, does not operate as listed with cassette systems. Cassette users should use the listing below to get their alternate cursor in operation.

```
1 REM ********************************
2 REM *                              *
3 REM * NO-FRILLS ALTERNATE CURSOR *
4 REM *        BY TOM HUDSON         *
5 REM *      ANALOG COMPUTING        *
6 REM *                              *
7 REM ********************************
10 FOR X=256 TO 364:READ N:POKE X,N:NE
XT X:POKE 2,0:POKE 3,1:POKE 9,2
20 ? "{CLEAR}PRESS RESET TO INSTALL CURSOR":
NEW
1000 DATA 169,1,133,13,169,0,133,12,16
9,0,141,7,212,169,1,141,111,2,162,1,16
0,40,169,7,32
1010 DATA 92,228,169,58,141,47,2,169,2
,141,29,208,96,0,0,216,169,1,141,240,2
,169,58,141,47
1020 DATA 2,169,0,170,157,0,6,202,208,
250,165,85,10,10,24,105,48,141,2,208,1
65,84,10,10,10
1030 DATA 24,105,39,168,169,240,153,0,
6,238,109,1,173,109,1,74,74,74,41,1,20
8,4,169,15,208
1040 DATA 2,169,0,141,194,2,76,98,228
```

CHECKSUM DATA.

*(see page 20)*

```
1 DATA 507,939,3,936,237,947,519,836,3
58,0,315,210,311,220,6338
```

Last issue, we mentioned CG0 (the computer's ship placement matrix) and CG1$ (the string which holds shooting information for the computer's ships). The human's shooting routine will affect these data areas, as shown in Figure 6, the detailed human shooting flowchart.

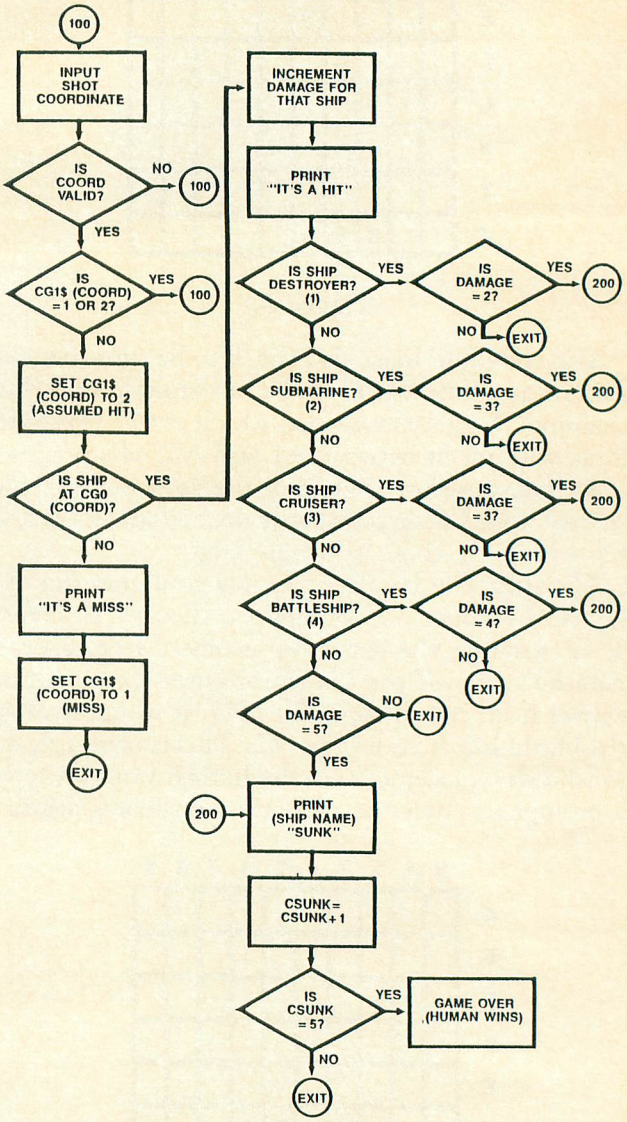



**Figure 6.**

As you can see in Figure 6, each position in the CG1$ string is used to record hits and misses (see last issue's **BASIC Training** for more on this).

If the shot was a hit, the computer finds out which ship was hit and adds one to a damage counter. Then, depending on the ship's length, the computer checks to see if the ship has been hit enough times to sink it. If so, a "sink counter" is incremented and checked for five sunken ships. If five ships have been sunk, the game is over—with the human winning.

So far, we've looked at the human side of **High Seas** and have seen how the human can win. Next issue, we'll start looking at what the computer will do to defend itself. And it won't be a pushover! □

*(continued from page 72)*

Of course, you'll need a modem, and there are several good ones to choose from. Atari's **1030** modem is a good value, as is Microbits Peripheral Products' **MPP-1100C**. The cream of the crop is the **Hayes Smartmodem**, but that will set you back about $300 for 300 baud and $500 for 300/1200 baud.

I have several gift suggestions for the creative individual on your gift list. **Movie Maker** by Reston Software ($49.95) lets you to create animated graphics sequences right on your screen. These can be edited, saved and combined to create all kinds of interesting and fun "movies." It's good for hours of fun and learning, and is something the whole family will enjoy.

A touch tablet for drawing and electronic doodling would be a nice gift for someone of any age. Atari's **Touch Tablet** is now selling for about $50—an excellent value. The price includes the easy-to-use **Micro-Illustrator** graphics program in cartridge form. The **KoalaPad** is more expensive (at $99.95 list) but has more software available for it. Either of these graphics tablets would be an excellent gift for a child.

**Games.**

No list of gift suggestions for the Atari user would be complete without a sampling of computer games. There are hundreds of games now available, but about a dozen stand out as being the best examples of game play or game/educational software. The best games fall into a handful of categories.

My favorite text-adventure game is **Planetfall** from Infocom. It combines adventure, science fiction and humor to yield a very engrossing example of what's known as interactive fiction. For a child or someone new to the text game genre, I would recommend **Seastalker**, also from Infocom. It's not as difficult or complex as **Planetfall**, but offers a good challenge and, like all Infocom games, has excellent documentation. Every Atarian should own at least one Infocom text-adventure game. Prices range from $40 to $60 list.

For definitive board games, turn to Odesta. Their **Chess**, **Checkers** and **Odin** (Othello) are excellent translations to the video screen and come with very complete documentation. They can be played at fifteen different levels, either with another person or against the computer.

It may sound surprising, but some of the best games are also educational. There are two flight simulators for the Atari that fall into this category. **Solo Flight** by MMG ($34.95) is fun to play, as well as useful for learning about flying. The most complete flight simulation program for the Atari is **Flight Simulator II** by SubLogic ($49.95). It's an excellent simulation of flying a single engine plane. The flight manuals that accompany the game are the most extensive I've seen for a home computer. Not only will you learn how to fly with this program, you'll also have a good time doing it.

One of the most creative and innovative games currently available for the Atari is **Pinball Construction Set** from Electronic Arts ($39.95). Written by Bill Budge, this game lets you create your own pinball games from a video parts box. You can then edit and save those games for future play. When a game is fun to play and challenging, I tend to ignore its other attributes. In the case of **Seven Cities of Gold** ($39.95), also from Electronic Arts, the hidden feature is self-awareness. You are a 16th century Spanish explorer searching for new worlds, peoples and glory. Your own personality and belief system determine how you play. It's excellent.

Two games that'll keep you hopping are First Star's **Flip and Flop** ($39.95), with its stunning graphics, and Parker Brothers' cute **Q*Bert** ($39.95). Most of the hopping games that appeared about a year ago were merely clones with no staying power. I find myself still playing these two.

Two of my all-time favorite games, which would make prized gifts, are First Star's **Boulder Dash** (at $34.95) and Synapse's **Necromancer** ($29.95). The first is a climbing/moving game that has a lot of personality. When it first came out, I played it constantly for weeks. **Necromancer** is similar but adds a bit of shoot-'em-up fun to its eerie, other-world quality.

My other favorites are **Frogger** (Parker Brothers, $39.95), **Lode Runner** (Broderbund, $34.95), Atari's **Star Raiders** (of course), **Pole Position** and **Centipede**. The Atari game cartridges originally sold for $44.95 list, but now can be had for as little as $15 in some stores. This is the time to pick them up—before they become unavailable. And, for a good game of baseball, Gamestar's **Star League Baseball** ($29.95) can't be beat.

Two more programs from Electronic Arts are **Archon** and its recent "sequel," **Archon II: Adept**. Both combine arcade action with strategy, offering the player a stylish twist on the classic game of chess. Both retail for $39.95 and are available only on 48K disk.

**For the Atari user who has everything.**

This last category of gifts is comprised of products that are either expensive or somewhat unusual. Either way, they would be fun to give or receive.

The best color monitor available is the Commodore 1702. It lists for about $350 but is heavily discounted. It will accept either composite or separate chroma and luminance video signals from the Atari 800 and 800XL, and displays a beautiful picture. You haven't seen what the Atari can do until you've seen it on the **1702**. The quality of the built-in amplifier and speaker is also excellent. There might be better ways to spend $300, but there is no better monitor for the Atari.

An excellent letter-quality printer is the Silver-Reed **EXP-550**. It normally sells for about $450 to $500 under other names like **Transtar 130**. The Silver-Reed uses changeable daisy wheels, has a wide carriage and

prints at 17 characters per second. It offers three type pitches (10, 12 and 15) and even proportional spacing. Carbon film ribbons can be used for exceptional quality printing. I've been using one of these printers for about two months now and love it.

Another high-ticket, excellent product is the **ATR-8000** from SWP Microcomputer Products. With various configurations and prices, it lets you use double-sided, double-density generic disk drives and CP/M with your Atari. A 48K printer buffer is available, as is adding 256K of RAM to run MS-DOS or use as an electronic disk. If you've not bought your first disk drive yet, or are considering adding another, check out the **ATR-8000**.

If you already have an **ATR** or are considering getting one, then the DT-80 80-column cartridge from Amiable Computer Enhancements may be of interest. It's a software-generated 80-column screen for use with the **ATR-8000**. It sells for $39.95 and, while not as good as a hardware 80-column board, is an inexpensive way to have 80 columns when using your **ATR**.

If you have an Epson printer and want an easier way to change fonts, then the **Fingerprint** from Dresselhaus Computer Products would be the gift for you. For $74.95, the **Fingerprint** consists of a couple of ROM chips that reside on the circuit board of the printer, allowing you to change fonts directly, by pressing the various buttons on top of the printer. Any of the printer's fonts can be selected at any time by simply pressing the buttons.

My final idea is a pair of wireless remote-controlled joysticks made by Atari. These sticks and the console originally sold for about $80, but are now available at places like Kay-Bee Toy Hobby for approximately $24. They are the genuine Atari product that can operate up to 20 feet away from the computer. They ease the tangled mess of wires that usually occurs when two people are competing head-to-head in an intense videogame battle.

**The wrap-up.**

That concludes my list of gift ideas for the Atari computer user. As I said at the beginning, this collection of products is a result of my personal experience and opinion gained from several years as an Atari enthusiast. I hope that I've either given you some useful suggestions for holiday gift-giving, or—if you leave this article open in a strategic place—helped you get what's on your Christmas list. □

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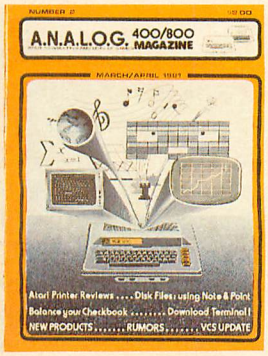


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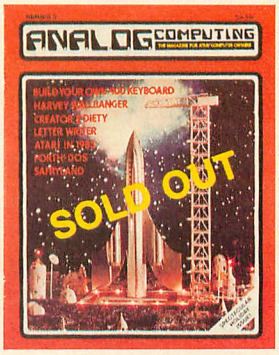


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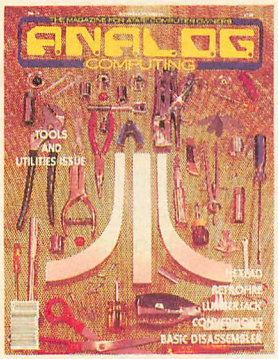


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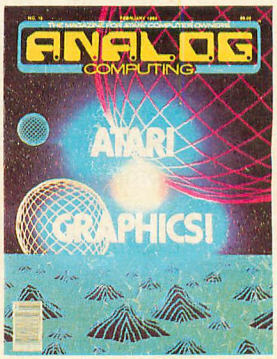


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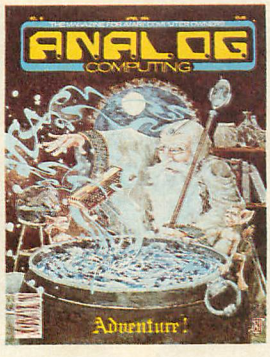


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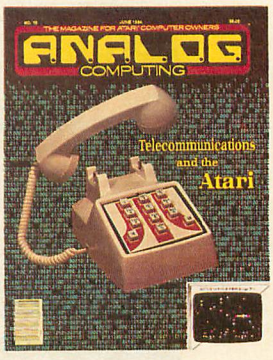


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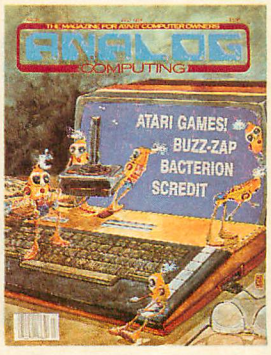


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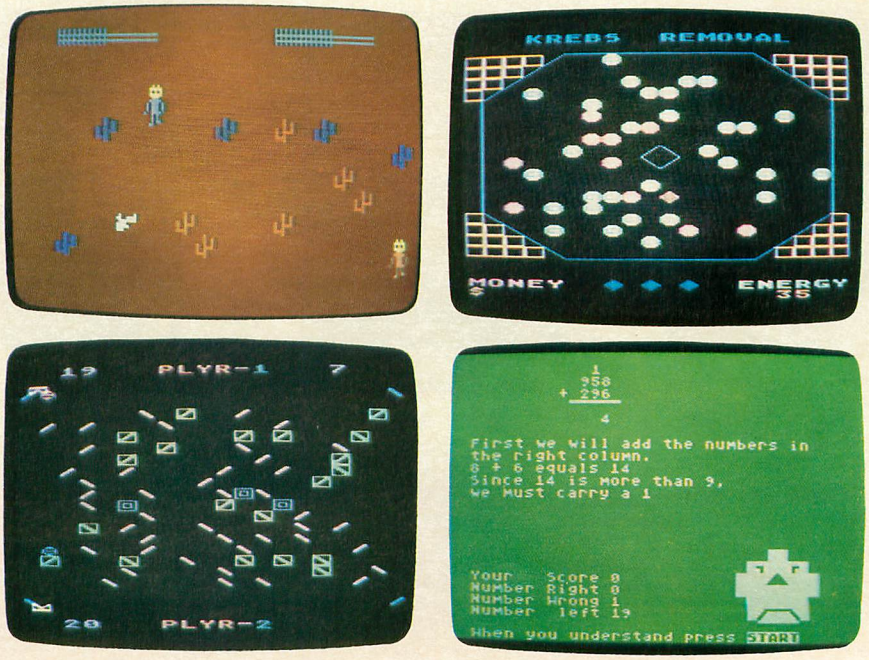
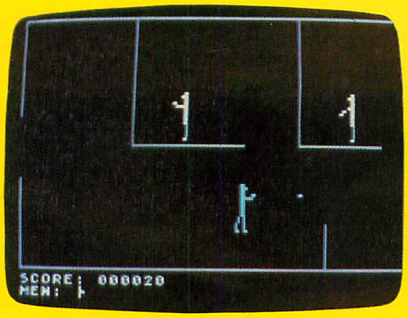
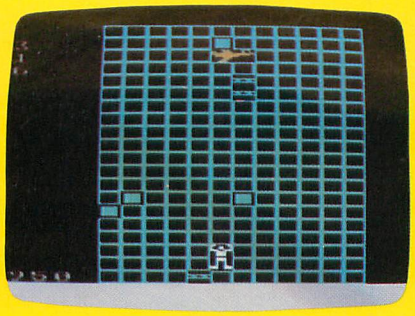
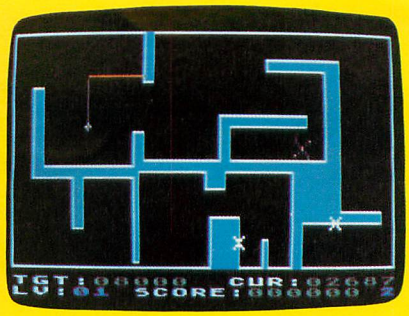




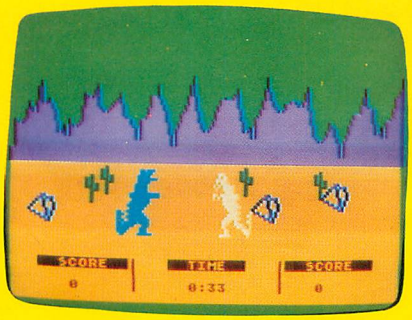

*Maniac!*



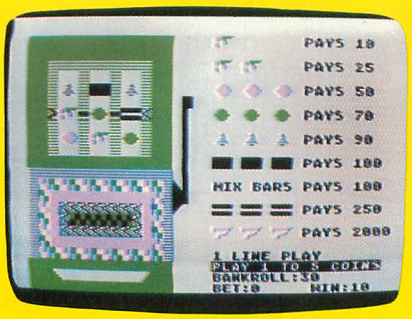
*Stuntman*



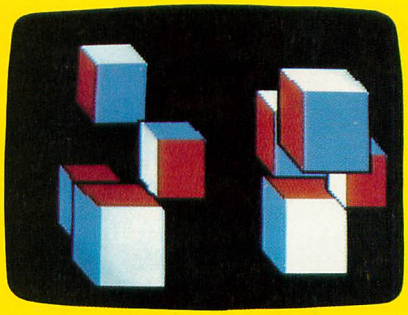

*Fill 'Er Up*




*Dino Battle*




*Color Slot Machine*



*Cubes*

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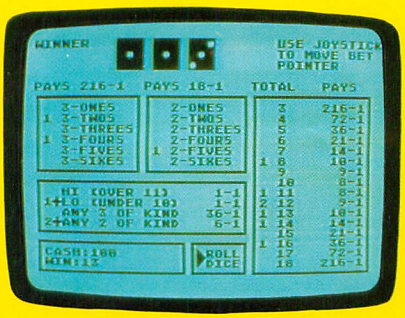
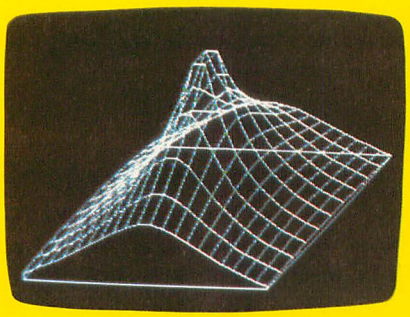



*Triple Threat Dice*



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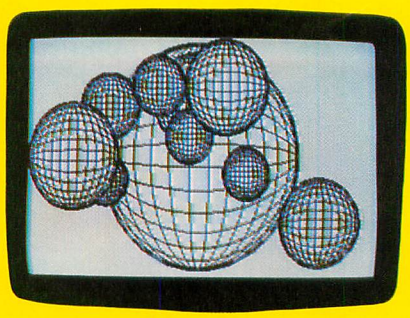
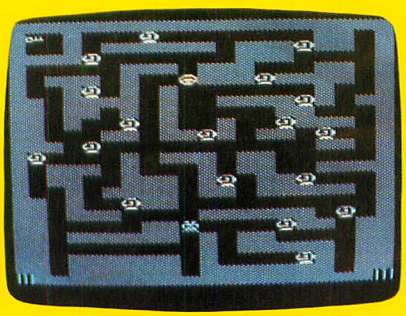
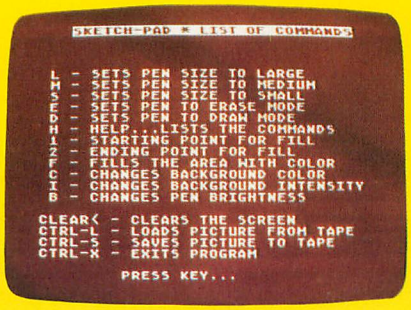


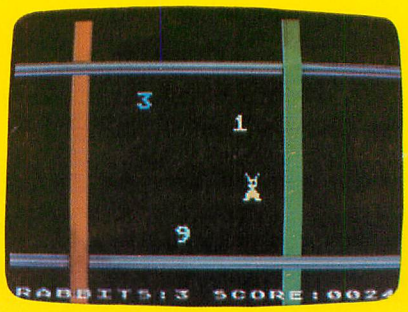
*Sphere Demo*



*Leprechaun King*




*Sketch Pad*




*Harvey Wallbanger*

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