The Future Of Synthetic Music

COMPUTE!

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The Leading Magazine Of Home, Educational, And Recreational Computing

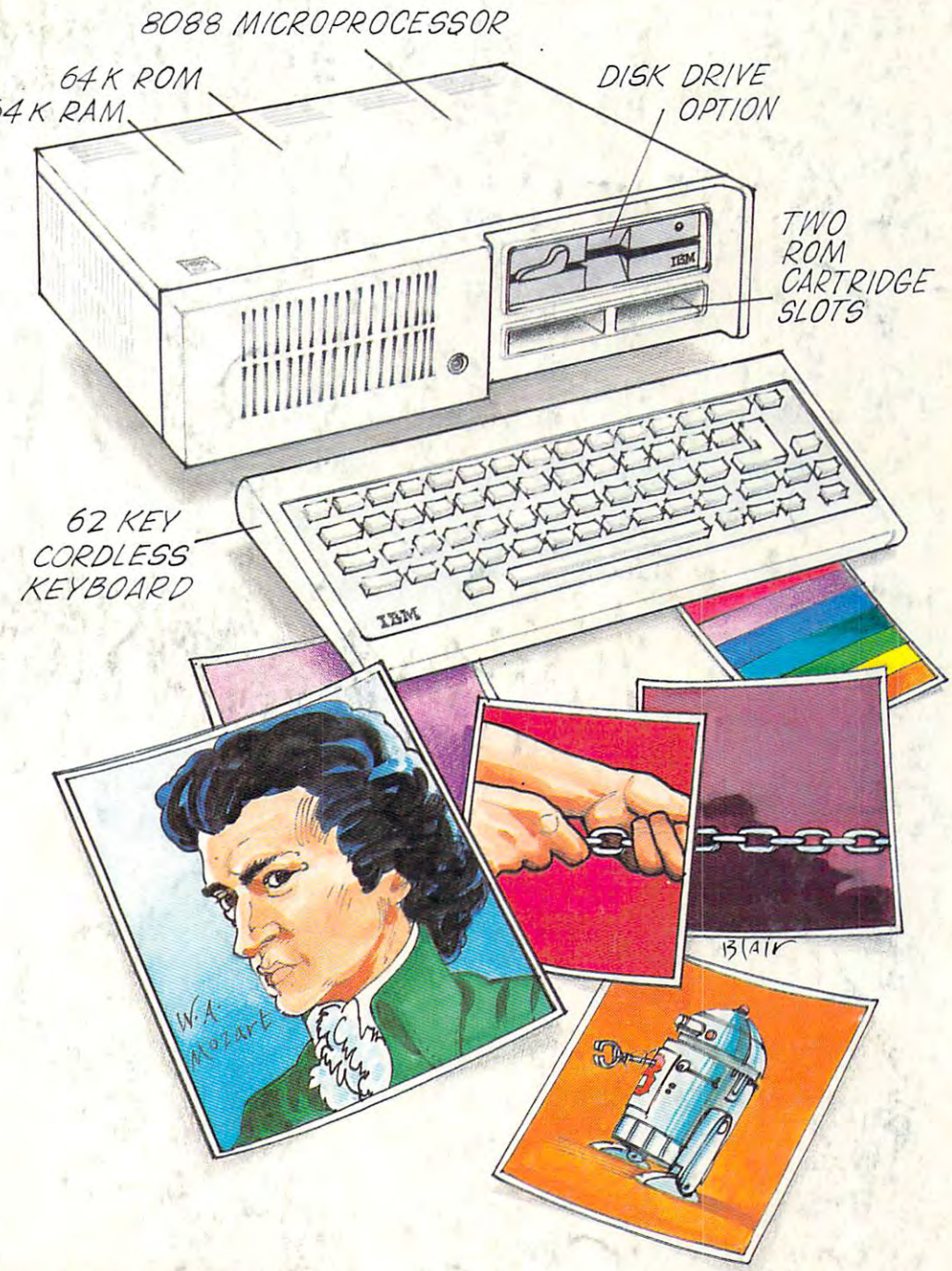
Report On IBM's PCjr

Robots That Roll, Crawl, And Bounce

Action Games For VIC-20, Commodore 64, Atari, And Others: *Demons Of Osiris* *Colorbot*

All About Chaining For VIC, 64, And PET

***The Mozart Machine:* Composing Program For VIC, 64, Atari, And TI-99/4A**



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So if you're looking for computer programs that do more than just "babysit" for your kids, read on. You'll find that our Early Learning Programs are not only compatible with **Apple,® Atari,® IBM®** and **Commodore 64™** computers, but also with kids who like to have fun.

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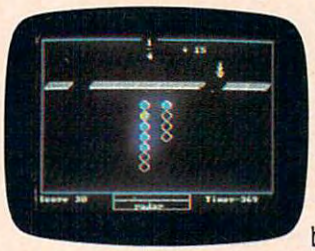

FRACTION FEVER is a fast-paced arcade game that challenges a child's understanding of fractions. As kids race across the screen in search of the assigned fraction, they're actually developing a basic understanding of what a fraction is and of relationships between fractions. They're even discovering that the same fraction may be written in a number of different ways.

All in all, FRACTION FEVER encourages kids to learn as much as they can about fractions – just for the fun of it!

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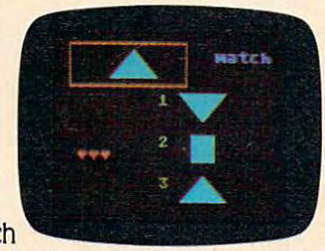
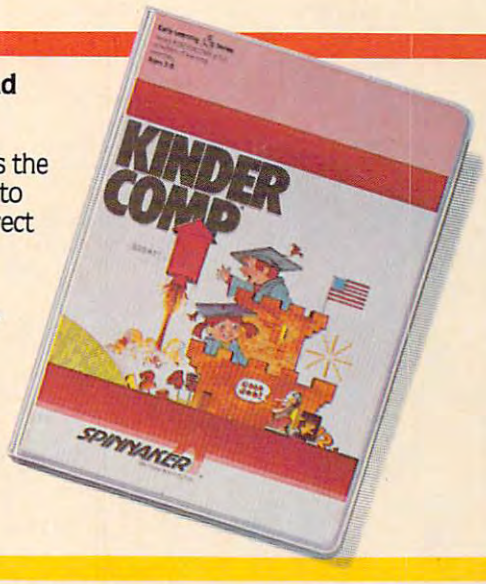
KINDERCOMP is a game that allows very young children to start learning on the computer. It's a collection of learning exercises that ask your children to match shapes and letters, write their names, draw pictures, or fill in missing numbers. And KINDERCOMP will delight kids with colorful rewards, as the screen comes to life when correct answers are given.



As a parent, you can enjoy the fact that your children are having fun while improving their reading readiness and counting skills.



FACEMAKER™ makes faces fun. Ages 4 to 12.

FACEMAKER lets children create their own funny faces on the screen. Once a face is completed, your children will giggle with delight as they make it do all kinds of neat things: wink, smile, wiggle its ears, or whatever their imagination desires.

Plus, FACEMAKER helps children become comfortable with computer fundamentals such as: menus, cursors, the return key, the space bar, simple programs, and graphics. FACEMAKER won't make parents frown because their children will have fun making friends with the computer.

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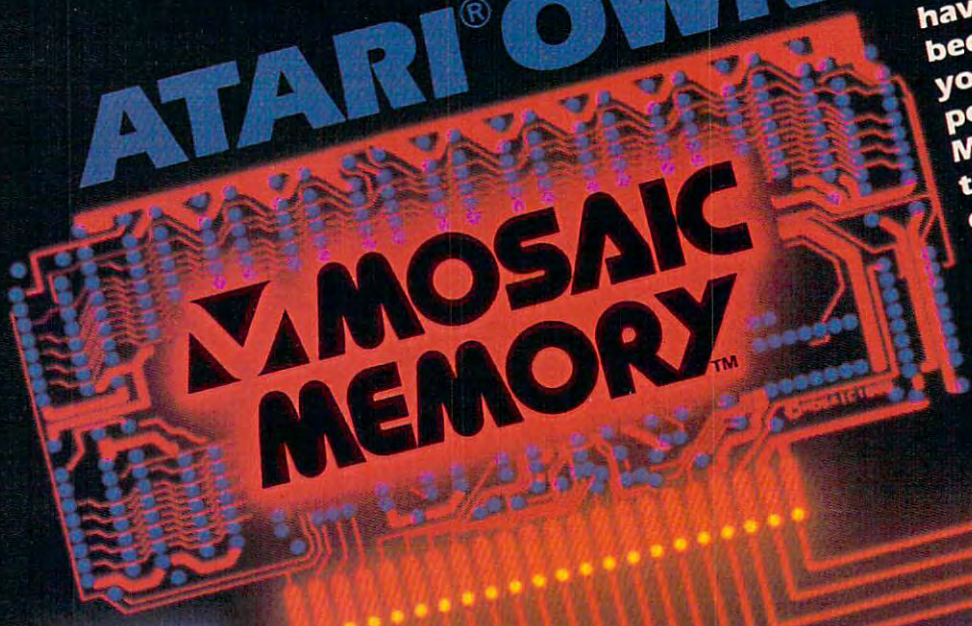

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EDITOR'S NOTES

As many of you will be aware, IBM has finally unveiled the long discussed PCjr. The unit (we described it in a recent GAZETTE editorial as "restrained as breakthroughs go") leaves something to be desired. A keyboard for one. Nonetheless, it is, after all, an IBM, and not to be taken lightly.

Atari and Coleco must have breathed collective sighs of relief, because both promptly raised January 1 pricing of their personal computer systems. Texas Instruments (too little, too late) is, for the first time in the history of their home computer division, selling every computer dealers can get their hands on, as fast as they can get their hands on them. Unfortunately, since TI doesn't make TIs any more, this phenomenon will soon be over. It's a bargain at $49.95!

We are pleased to report that there are teeth to TI's promises of continued support. They do plan to continue to market support software; establish a user service hotline; and, most importantly, will continue to service and repair their computers. At least they're withdrawing with class and appropriate concern for their customers.

Back to IBM's highly successful PCjr. It will be quite successful. First, it's defined a market niche that aims it rather directly at Apple and Atari, slightly above Coleco, and several hundreds of dollars above Commodore. It will compete quite well against the well-established Apple software library, and IBM's marketing strength is certainly ahead of the struggling Atari. The fact that Atari and Commodore have superior sound and graphics capabilities may go unnoticed by many in the marketplace. Coleco's packaging strategy is still an unknown, and since we've been unable to get our hands on a Coleco, we'll have to be more restrained in our bold predictions.

In recent editorials, we've commented that frequently the most inexpensive thing in a computer system is the computer. Happily this isn't the case with the PCjr. There are many, many "optional" accessories one can add without getting close to the price of the entry-level $689 computer. Among these are joysticks (a maximum of two) at $40 each; an adapter cable so you can hook up a cassette drive for $30; an extended Microsoft BASIC cartridge for $75; and so on. Get the picture?

In spite of the inevitable muttering and groaning by members of the personal computer industry press, the IBM PCjr will make a definitive mark on 1984 and the home computer industry. For one thing, IBM's entry will attract buyers that have been reluctant to join the home computer revolution. IBM's credibility, support, and service will greatly enhance their ability to more aggressively promote the use of computers in educational settings. And the installed year-end base of IBM PC's (estimated at approaching 500,000) will surely provide a ready-made customer base for home users of the PCjr. IBM has very wisely paid full attention to the necessity of compatibility.

Where does this leave us? Well, given the above comments, not surprisingly we're introducing a third magazine in the COMPUTE! Publications, Inc., family. COMPUTE!'s PC & PCjr Magazine will premier with a March issue. It will contain the same kind of useful applications information, tutorials, and programming assistance that are currently provided by COMPUTE! and COMPUTE!'s GAZETTE for Commodore. Concurrently, we're adding the PC and PCjr to COMPUTE!'s more intermediate and advanced editorial coverage.

In this issue, you'll find a factual overview of the new PCjr by Editor Tom Halfhill. Tom will become the editor of our new PC & PCjr magazine. If you own or use an IBM PC, or purchase a PCjr whenever they're really available, we're actively recruiting columnists and writers for our IBM support. Address your queries and submissions to Tom Halfhill, COMPUTE!'s PC & PCjr Magazine, Post Office Box 5406, Greensboro, NC 27403. If you have an IBM PC- or PCjr-related book proposal, we'd certainly be interested in seeing that as well. Send your queries or proposals to Stephen Levy, Book Division Editor, at the same post office box.

Robert Lock

Editor In Chief

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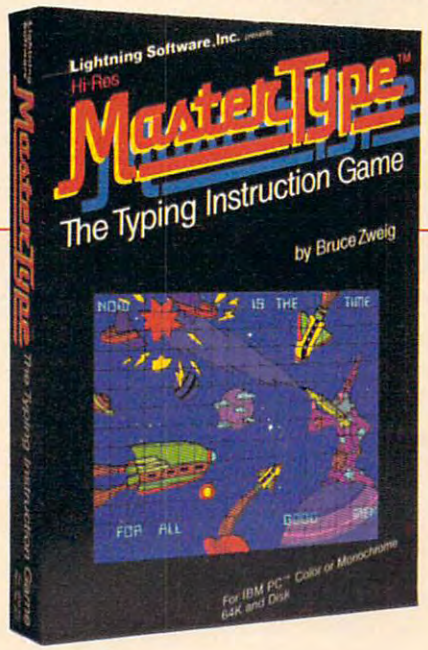

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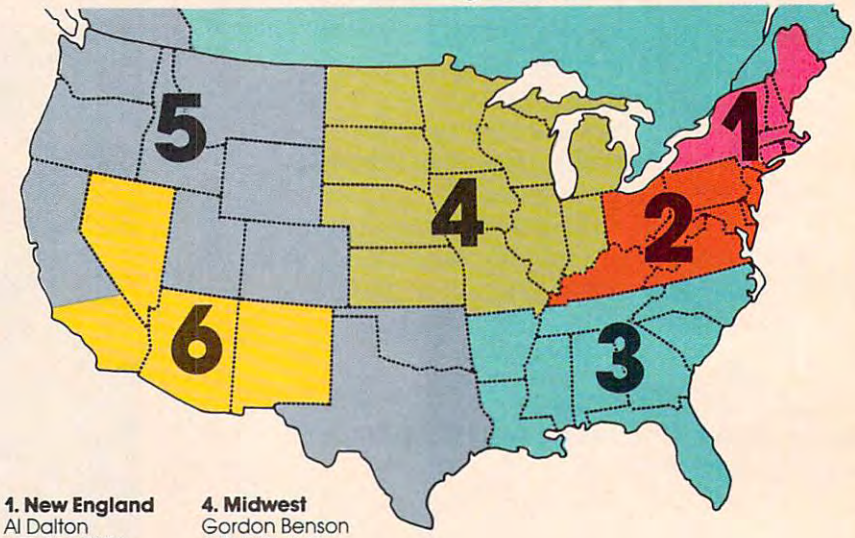

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READERS' FEEDBACK

The Editors and Readers of COMPUTE!

Computing With Kerosene

Our local computer columnist recently wrote that kerosene heaters and home computers don't mix. He stated that one by-product of kerosene combustion is a conductive film that gets on everything, including computer chips. He concluded that kerosene heaters and computers should not be in the same house. Any comment?

Charles Ranney

An interesting point. In general, burning fuels and sensitive electronics don't, in fact, mix well. Although we have no firsthand experience with the combination you've cited, we have seen what happened to a phone connection box installed right next to a gas heater—lots of corroded wires.

It probably has something to do with the proximity of the heater and how often the heater is used. The situation can't be as serious as the columnist implies, however. Most modern televisions contain electronics of roughly equal sensitivity to a computer. If the stoves damaged TVs, we surely would have heard about it by now, considering the hundreds of thousands of such heaters currently in use.

Nevertheless, it probably wouldn't be a bad idea to use an electrostatic air cleaner just to be on the safe side.

Program Line Addresses For VIC And 64

John B. Swetland's letter (COMPUTE!, July 1983) and his program for locating program lines on the Timex/Sinclair prompted me to share a similar program with VIC and 64 users. This program also provides the starting and ending addresses for any program line, but gives the total program length rather than the length through the particular program line. (Actually, the program length will be two bytes low, since the program ignores two of the three zero-bytes which end the program.) The indicated addresses are provided in decimal and hexadecimal which facilitates the location of internal program POKEs and the use of a monitor.

To prepare the program, type it in exactly as shown, insuring that there is a space between the first set of quotation marks and the word "line" in line 63986. RUN the program, then enter, in direct mode, POKE SA+9,25 (ignore the "illegal quantity" error message produced by running the unfinished program). This POKE puts a special "end of program" marker in line 63986; line 63989 looks for this marker, and when it finds it, ends the program run. Finally, SAVE the program using the program name "line locater".

To use the program, append it to the program that is to be examined as follows:

1. LOAD the program that is to be examined.
2. Enter in the direct mode: POKE43,PEEK(45)-2:POKE44,PEEK(46)
3. LOAD "line locater", device number (1 for tape, 8 for disk).
4. Enter in the direct mode: POKE43,1:POKE44,8

Finally, type in direct mode RUN 63987.

James J. McQueeney III

```
63986 STOP:REM " LINE LOCATER"
63987 PR$="Ø123456789ABCDEF"
63988 PA=PEEK(43)+256*PEEK(44): SA=PA: IN
      PUT"LINE NUMBER"; LI
63989 PL=PEEK(SA):PS=PEEK(SA+9):IF PS=25
      {SPACE}THEN 63996
63990 PH=PEEK(SA+1):LN=PEEK(SA+2)+256*PEE
      K(SA+3):PN=PL-1+256*PH
63991 IF LN=LI THEN 63993
63992 SA=PN+1:GOTO 63989
63993 PI=SA:GOSUB 63997:SA$=PY$:PI=PN:GOS
      UB 63997:PN$=PY$
63994 PRINT"BEGINS AT";SA;"($";SA$;"),"
63995 PRINT"ENDS AT";PN;"($";PN$;")":SA=P
      N+1:GOTO 63989
63996 PE=SA-PA:PRINT"PROGRAM IS";PE;"BYTE
      S LONG":END
63997 PY$="":FOR N=3 TO Ø STEP-1
63998 PZ=INT(PI/(16↑N)):PX$=MID$(PR$,PZ+1
      ,1):PY$=PY$+PX$
63999 PI=PI-PZ*(16↑N):NEXT N:RETURN
```

An Easier Load For Atari Binary Files

In the September Readers' Feedback column, Forrest Meiere offers a very useful routine that allows BASIC programmers to load binary files from BASIC on the Atari.

As long as we're making illegal jumps into the operating system, here is a much simpler routine that does the same thing.

```
OPEN #1,4,0,"D:PROGRAM.OBJ"
X=USR(5576)
```

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PROGRAM.OBJ is of course any valid filename that can be loaded with the L function from Atari DOS II. This is particularly useful when using either the Datasoft BASIC Compiler or the Monarch ABC Compiler, since neither allows you to load and run other programs.

For readers who use the Axlon RAMdisk, the appropriate location to jump to is X=USR(6060). If the Monarch ABC Compiler has been used without the relocating loader, you may then jump back into the calling program with the M command and address $2600. This information first appeared on the Atari SIG on CompuServe.

Michael H. Reichmann

We've tried this useful technique, and it works well. Because the DOS routine does not have the PLA that USR requires, you will get an ERROR 9. Just ignore it, or use TRAP to make BASIC ignore the error for you.

TI Cartridge Loading Problems

I'm wondering if any readers have had problems using TI cartridges with the TI-99/4A. I've had no problem loading them the first several times, but after ten or so uses of the same cartridge, loading becomes increasingly difficult. I've had problems with the keyboard locking up and with broken screen display patterns. It often takes me ten or more tries to load and run something successfully. Have any of your readers experienced such problems and, if so, have any solutions been found?

Charles J. Smith

We have many TI cartridges here at COMPUTE! *and, even after prolonged use, haven't had any of the problems you mention. One possible cause is dirty contacts on the cartridge. To prevent this, you should occasionally clean the contacts. On the back of the cartridge (where the cartridge is fitted into the slot), manually depress the spring-loaded section, and you'll see an edge with about 18 contact strips. Use a cotton swab moistened with either contact cleaner fluid or rubbing alcohol. Rub the contacts gently with the swab, allow them a few seconds to dry, and your cartridge will be ready to use.*

If this doesn't help with your loading problems, we suggest you try the suspect cartridge in another TI computer and, if there's still a problem, contact your dealer. If any readers have had this same problem and found a solution, we'd like to hear from you. On the other hand, if you're using a kerosene heater, all bets are off.

More "Extra Instructions"

Joel Shepherd's article "Extra Instructions" for the 6502 (COMPUTE!, October 1983) presents a fascinating peek into the mysterious workings of microprocessors. I wonder, though, if the limited usefulness of these instructions would warrant the trouble of expanding our assemblers to include them. For instance, since the decrement/compare instruction (DCMP) ties up the accumulator, it would be of limited value in real applications. Likewise, how often does a real program need to load the accumulator and the X register simultaneously from a single memory location? Now, if you could load *immediate* data to both registers with one command, that *would* be handy.

After a few minutes at the keyboard, I discovered that Mr. Shepherd has revealed only the tip of the iceberg. In fact, most of the "unofficial" opcodes do something. Here are a few that would be really useful:

Opcode			"Mnemonic"		
ab	xx	:	LAX	#$dd	(.a=data) (.x=data)
cb	xx	:	SBX	#$dd	(.x=.x−data) (*without* carry)
8b	xx	:	NAX	#$dd	(.a=.a and .x and data)

There are many more. The most bizarre extra "instruction" I found was:

```
bb xx xx : ZSP $aaaa,y  (sp=sp and $aaaa,y)
                        (.a=sp and $aaaa,y)
                        (.x=sp and $aaaa,y)
```

That's right, the contents of the stack pointer are anded with indexed absolute memory and the result placed in the accumulator, the .x register *and* the stack pointer (ZSP is Zap Stack Pointer). Talk about limited usefulness!

One more point: If assembler modification is contemplated, three-letter mnemonics should be used, since such programs often take advantage of the fact that all standard 6502 mnemonics have three letters only.

Once again my thanks to Mr. Shepherd for a very stimulating article.

Henry Gibbons

"Extra Instructions" And 6502 Design

Joel Shepherd's article "Extra Instructions" (COMPUTE!, October 1983) was fascinating. Some of these instructions appear quite useful. It must be remembered, however, that the published instruction set for a microprocessor constitutes, in a sense, a "contract" between the maker and the user.

The "extra" opcodes are not guaranteed across design revisions of a chip from one manufacturer, or among separate designs of what appear to be the same chip from different manufacturers. A good example is redesign for less silicon area. The less area, the more chips per wafer and—all else being equal—the more chips per dollar of processing. The redesign might change a microprocessor using a "state machine" architecture—a programmed logic array and register design to a microcoded design—essentially

ATARI 5200

TI99/4A

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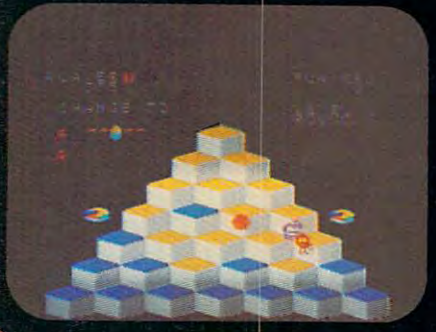

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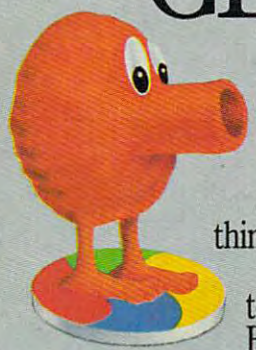

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a little computer inside the computer. The new chip might meet all published specifications yet be radically different inside. The "extra" instructions might also do something completely different—or nothing at all.

Similar caveats apply to the electrical aspects of microprocessors. Often very interesting things go on internally and in between the defined places on the timing diagrams. The early TI 9900 chips are an example of this. Bitter system designers can even relate mechanical horror stories, like manufacturers deciding to "slightly" move a few pins around on their microprocessor.

With respect to the 6502, it would be interesting to see how many owners of the various home computers with 6502s can use these instructions. My Atari can at least execute the ANDX and thus likely can execute the others.

Brian Converse

64K And Bank Memory For The VIC-20

Recently, I have seen 64K expansion cartridges for the VIC-20. They use something called "bank memory." Since the VIC is expandable only to 32K, how do you get 64K? And what is bank memory?

Robert Bleich

The 6502 microprocessor (the "brain" of Commodore, Atari, and other computers) can access only 64K of memory at one time. Of this total, various amounts are used up by the VIC's operating system in ROM, and by peripheral chips, including the VIC (video) chip. There is a maximum of 32K of space left for user memory (RAM) in a VIC. Some RAM expanders get around this by letting you swap out pieces of your user memory. For example, one 8K block could be replaced by any of four other 8K blocks, giving you 32K of memory in one 8K space. You just bank-select *which of the blocks of memory you want to move into the actual address space.*

Bank selection varies among RAM expanders in several ways: in the size of the blocks, the number of bank-selected blocks, and where the switchable blocks will reside. For example, a 64K device might give you 32K of memory the usual way, then let you switch to an alternative 32K block all at once. On the other hand, it may be configured as eight 4K blocks, two 16K blocks, four 8K blocks, etc. One other thing: You can only take advantage of the 64K from your own programs, as commercial software can hardly be expected to figure out how your cartridge is bank-selected.

Atari Color Explosion

Here's a program that demonstrates all 256 colors on the Atari. It uses GRAPHICS 9 and a lot of display list interrupts.

Thomas Brandner

```
10 GRAPHICS 9
20 FOR A=0 TO 79:COLOR INT(A/5)
30 PLOT A,4:DRAWTO A,191:NEXT A
40 FOR A=1536 TO 1562:READ B:POKE A,
   B:NEXT A:D=PEEK(560)+256*PEEK(561
   )
50 FOR A=0 TO 14:READ B:POKE D+B,143
   :NEXT A
60 POKE 1616,0:POKE 512,0:POKE 513,6
   :POKE 54286,192
70 GOTO 70
80 DATA 72,173,80,6,24,105,16,141,80
   ,6,141,10,212,141,26,208,201,240,
   208,5,169,0,141,80,6,104,64
90 DATA 17,29,41,53,65,77,89,104,116
   ,128,140,152,164,176,188
```

Try this. It's pretty impressive.

Serial Or Parallel?

What is a serial or parallel printer? How can I tell if my printer is one of these or both?

Rajeev Rohtegi

A printer must receive and send data to and from the computer and therefore requires an interface *(a connection which makes two things able to communicate). Most printers have either a serial or parallel interface built-in.*

A serial printer has a single channel and receives one bit at a time—in a series*—from the computer. A parallel printer has a multichannel connection and receives one byte, or eight bits, at a time.*

Parallel printers are faster, easier to use with a variety of software, and can be more expensive. Serial printers often require the user to manipulate certain functions (baud rate, word size, parity, etc.) for compatibility with different software.

There is no simple way of telling which kind you have, but your manual should certainly make it clear.

What Is An RGB Plug?

I have a Commodore 64 and a Data Grade Panasonic Color Monitor (CT-1-300D). The monitor has a video/audio RCA input and an eight-pin female RGB input, which the manual says is for computer applications. The RCA input works fine with the 64, but what is the RGB plug and how do I use it? I've written to Commodore and Panasonic, but to no avail. Can you help?

John G. Laing

The basic principle of black and white television is that a "gun" sprays a controlled stream of electrons across a specially treated screen. When the electrons hit there are light spots, and where no electrons fall the screen remains dark. The arrangement of light and dark patterns forms the image on the screen.

Color televisions are more complicated. Instead of just one electron gun, these TVs have three—one each for red, green, and blue (hence RGB) signals. Instead of

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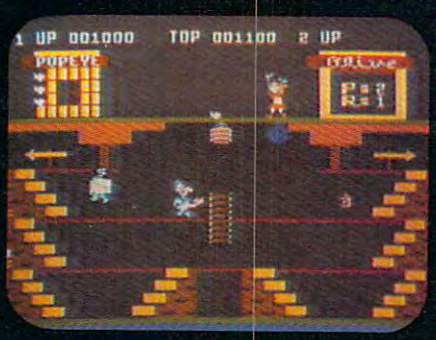
ATARI 400



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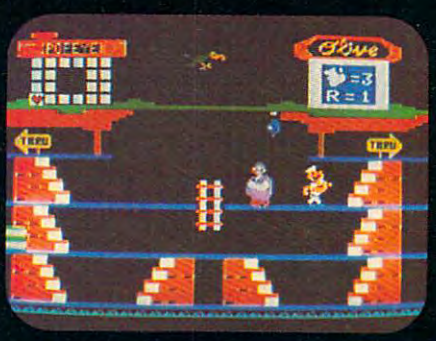

TI99/4A

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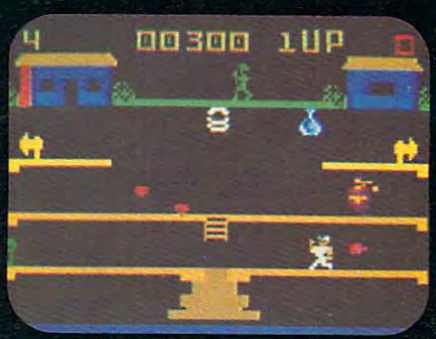

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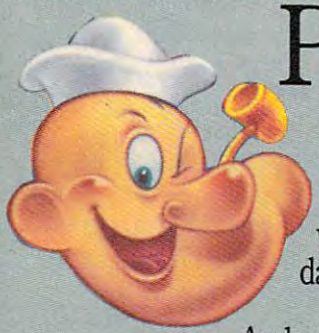

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combining into light and dark patterns, the three colors mix to form various hues to produce the multicolor screen image. In a television, and in most inexpensive color monitors, there is only one input signal for all three colors, and the TV or monitor must separate the parts for each gun. More sophisticated (and usually more expensive) RGB monitors allow you to have direct control over each gun. As a result, the picture on such a monitor can be much sharper and more detailed.

Unfortunately, separate red, green, and blue signals are more difficult to produce. So, few home computers have an RGB video output. The VIC-II chip in the Commodore 64, for example, produces only a combined chrominance signal, not three separate signals. Special interfaces are available for some RGB monitors to provide RGB signals from a combined chroma signal, but we're not aware of one for the 64. One other problem—RGB has not yet been standardized. Thus, the plug from a computer might not match the input to an RGB-capable monitor.

Multicolor Players From BASIC On The Atari 400

I own an Atari 400 with 16K. Is there any way to achieve multicolor players from BASIC? Was it described in an earlier COMPUTE! issue?

Gary Resheff

With machine language, you can dynamically change a player's color while the screen is being drawn, but this is exorbitant in terms of the processing time needed. There is a better way, discussed in COMPUTE!'s First Book of Atari Graphics *("The Priority Registers"), in which you can overlay two players to share two colors, as well as have a third color formed by overlapping pixels. This technique was used for a multicolor airplane in the Atari version of the "Air Defense" game (*COMPUTE!*, April 1983).*

VICmodem 1600 And 1650 Differences

What is the difference between the VIC 1600 Modem (VICmodem for VIC/64) and the new 1650 modem? Do they have 40-column screens? If not, do you need a 40-column screen? If so, how do you get one (hardware or software)? I'm eventually going to trade in my VIC for a 64. Are these modems and their software compatible with both the VIC and 64?

Matt Schmidt

The VICmodem (1600) was the first modem that Commodore offered for the VIC and the 64. Because it plugs into the user port, it can be used with both the 64 and the VIC.

The 1650 modem is the new offering available from Commodore for about $100. Because the 1650 is designed to plug into the expansion port, it will only be usable with the 64. The 1650 is an auto dial/auto answer modem that comes packaged with a tape cassette containing the necessary software support, and one free hour on CompuServe.

The format of your screen (40 columns) is not controlled by the modem, and you do not need any special screen software to use either of the modems. It should also be noted that the tele-terminal software available for the 1600 modem is not compatible with the new 1650 modem.

Pascal On The Atari

I know that you can use Pascal on the Apple with only one disk drive. I have an Atari 800 with one disk drive; I heard that you need two disk drives to run Pascal on the Atari. Is it possible to run Pascal on the Atari with only one disk drive?

Tim McWain

Pascal for the Atari was originally developed for use with the 815 dual-drive, double-density disk system, as it requires large amounts of disk storage for the compiler and compiler work space. Pascal's future looked grim after the 815 was cancelled, but an enterprising programmer managed to modify Pascal so it would go between two drives, with the equivalent of half of an 815 disk on each drive. Both drives need to be accessed during compilation. The Atari and Apple products are not versions of the same product, but Apple Pascal has more disk space to work with per drive (140K versus 90K).

You may be interested in other language alternatives for the Atari. The most Pascal-like is Action from Optimized Systems Software. It only requires 16K and can work with cassette. Other languages include Forth and C, with versions available from several companies including the Atari Program Exchange. PILOT is available from Atari, Inc., and an Atari Logo is forthcoming.

Electronic Typewriters As Printers

I would like to add to the comments made in COMPUTE! (November) about using typewriters as printers. While I have serious doubts about the suitability of a mechanical electric typewriter with solenoids placed over the keys, I know from experience that modern electronic typewriters are perfectly acceptable for use as printers. Electronic typewriters are themselves computers of sorts. The keyboard (input device) is constantly scanned; when a key is pressed, a signal is sent to the logic board (CPU). A typing program, in ROM, enables the printer (output device) to make the desired impression on paper.

Interfaces for electronic typewriters connect between the keyboard and the logic board, al-

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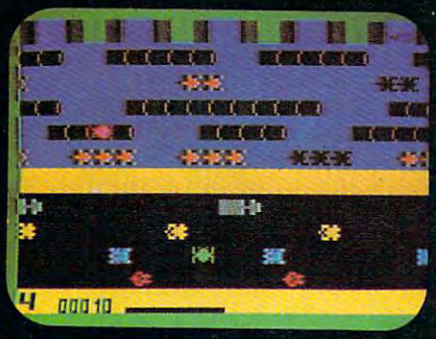

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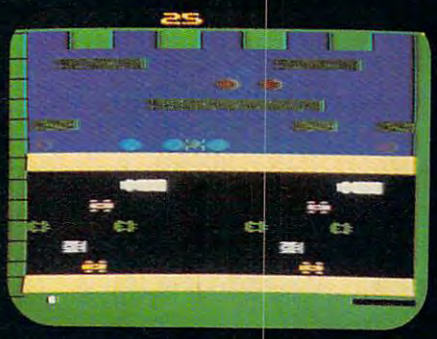

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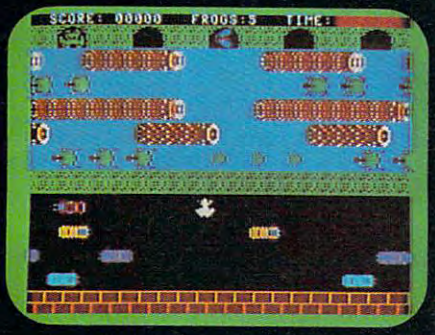
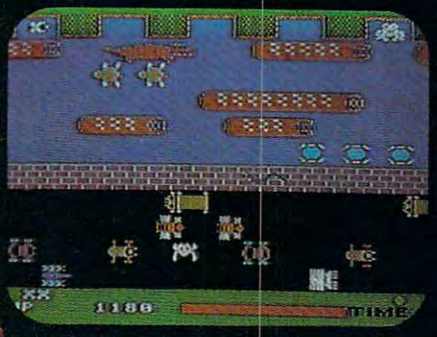


COMMODORE 64



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lowing the computer, rather than the typewriter keyboard, to be the source of input; the interface handles handshaking. Most interfaces have a selectable baud rate, line feed enable/disable, form feed, and other useful features. Parallel and serial interfaces are available. Normal typewriter functions are not affected.

All major typewriter manufacturers offer interfaces for their high-end electronic typewriters, but these machines will likely be too expensive for many home users. However, typewriters such as the Olympia Electronic Compact, Swintec 1146CM, Adler Satellite II, Royal Alpha 2001, and the Olivetti Praxis series are available (and already interfaced) for under $1000. Some of these machines might even be available at discount stores. If you already own the electronic typewriter, let the *dealer* install the interface to keep your warranty or maintenance contract active (your maintenance contract rate may rise slightly with the addition of the interface).

The interfaced electronic typewriter provides the home computer user with two machines in one package: an up-to-date electronic typewriter along with a printer with unsurpassed impression quality. It is an alternative well worth consideration.

J. A. Jaynes

Interfacing The Epson MX-80 With A 64 And 1541 Disk Drive

I'm finding that I write longer programs and have grown out of my present computer capacity and need to either expand my existing system or start over. I can get set up with a Commodore 64 for less money than it would cost me to expand my present system. I would like to buy the computer and disk drive, and retain my Epson MX-80 printer. From what I have been able to determine, the disk drive and printer use the *same* RS-232 interface connection on the computer. It seems that each time I want to use the disk drive I would have to disconnect the printer and then, when I'm through with the disk drive, disconnect it and plug in the printer again. Can you help?

George O'Kelley

There is some confusion here about the serial port used for Commodore disk drives and printers, and the separate RS-232 port which is used to add third-party serial devices such as modems, digitizers, plotters, and RS-232 printers. You can attach both a Commodore printer and a Commodore disk drive by plugging the disk's cable into the computer, and the printer's cable into the disk drive via a second connection. This is known as daisy chaining.

Your MX-80 will not plug directly into the Commodore serial port, because that port is not RS-232 standard serial. In fact, the serial port signals are modeled on those of the IEEE port of the PET/CBM models. If your printer has a built-in RS-232 port, you can attach it to the User Port (modem port) with the Commodore RS-232 cartridge. This cartridge performs voltage conversions (the lines coming out of the User Port are at the computer's level—0–5 volts, whereas most serial printers and modems need voltage levels from −12 to +12 volts). If your MX-80 has a Centronics parallel port, there are interfaces available which plug into the disk drive and convert the data from the Commodore serial port into parallel format for your printer. There are some interfaces which convert the User Port into a software-driven parallel port, but this function is separate from the use of the User Port as an RS-232 port.

What Are Sprites?

I recently bought an Atari 800 and I am wondering if it has sprites, and if so, how many.

Paul Mercurio

A sprite is a movable display object. Its shape is different from a character or graphics pixel, due to its independence from other screen activity. A true sprite can pass over any background text or graphics without disturbing the background. It is also usually faster and easier to program than a bitmapped (high-resolution) shape. Machines with sprites usually include features such as collision-checking (have one or more sprites touched each other?) and variable height and width for the sprites.

The Atari 800 has four such sprites, called players, *and four tiny two-bit sprites called* missiles *(the missiles can be combined to form a fifth player). They can each be eight bits (dots) wide, and up to 256 lines high. The use of players is not limited to games. They can also form borders, special tall characters, cursors, or even a checkerboard. Other machines that have sprites are the Commodore 64 (with eight 24 × 21 sprites with multicolor capability), and the TI-99/4A (whose sprites can be moved automatically by the computer).*

Our reference to a game by Michael S. Holtzman and Timothy Baldwin in the October 1983 issue was incorrect. It should have been: Michael S. Holtzman and Mark Kershenblatt.

COMPUTE! welcomes questions, comments, or solutions to issues raised in this column. Write to: Readers' Feedback, COMPUTE! Magazine, P.O. Box 5406, Greensboro, NC 27403. COMPUTE! reserves the right to edit or abridge published letters. ©

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The Future Of Synthetic Music

Richard Mansfield, Senior Editor

Something is about to happen to music. Synthetic music, *synthesizers*—those machines which can sound like entire orchestras at the touch of a button—are becoming inexpensive consumer items. Soon, anyone will be able to afford this powerful musical tool: an instrument which can be programmed (you can make technically perfect music even if you're tone deaf or have no rhythmic sense); can sample and hold any sound via a microphone (you could write a concerto for doorbell and dog orchestra); and can create digital "tracks" in RAM memories (you layer sounds as if you were a one-man band and had rented a professional recording studio).

Anyone thinking of buying a piano or organ for their home now has to think twice. A good synthesizer can offer all the sounds of an organ, plus a harpsichord, drums, piano, and even realistic violins and cellos.

Hal Chamberlin, an authority on computerized music, believes that synthesis-on-a-single-chip technology now has made small and affordable what used to cost thousands of dollars and was very large indeed. The revolution in electronics, which made personal computers possible, is now transforming music.

Synthesizer pioneer Robert Moog predicts that—with a Casio synthesizer already selling for under $100—prices are not going to fall much further. Materials will not go down much in cost. Furthermore, he says that synthesizers will never replace an instrument like the guitar. They won't be as transportable. You cannot sing along with a synthesizer quite the same way that you can with a guitar. Most synthesizers have to be plugged into your stereo amplifier and played through your speakers. That would be hard to set up on the beach.

Some portable synthesizers do contain built-in amps and speakers, but there's always the problem of power. Moog doesn't expect electronic keyboards to simply replace traditional instruments in every situation: "Not until there's a technical breakthrough, which, as far as I know, no one currently foresees. Battery power cannot do that much, but they will replace home organs, electric pianos, etc. They simply have more potential."

The Sound Of The Nineties

Research on sound synthesis is moving at a rapid pace these days. Moog says that in the next decade

A video display of waveforms and a computer keyboard accompany New England Digital's Synclavier II.

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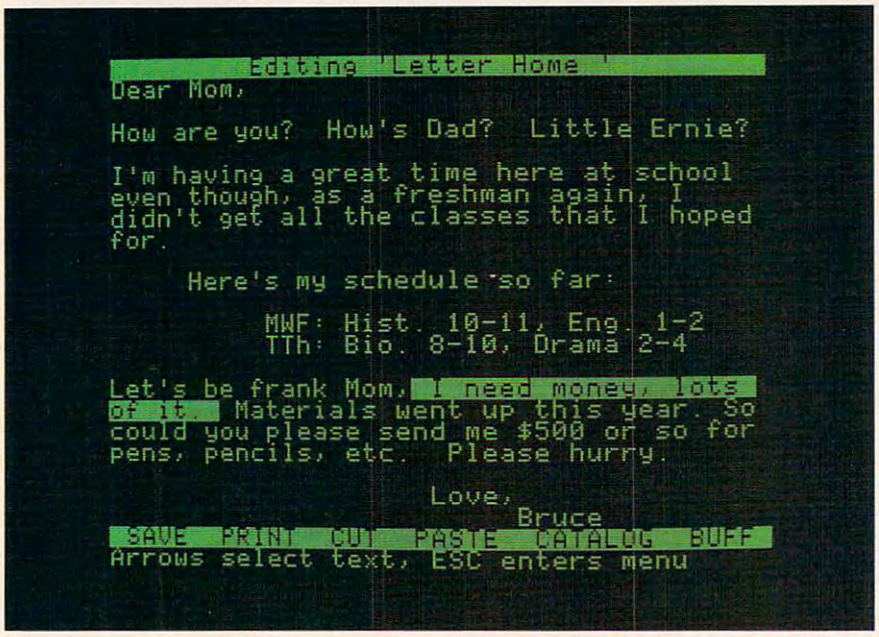

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In other words, Cut & Paste will do just about everything other word processors do. But Cut & Paste will do it more easily. Without complex commands and modes.

If you think about a word processor in terms of what it replaces (typewriters, pens and paper, files), Cut & Paste begins to look very good indeed.

And when you consider that *all this power can be had for approximately $50,* we think you'll see why we believe Cut & Paste is something of an achievement.

A PHILOSOPHY OF DESIGN. The people who designed, developed and programmed Cut & Paste have some fairly heavy credentials.

They are people who worked on the internationally-famous user interface designs that led to the Xerox Star® and Apple's Lisa.® They are also

THE CHANGING OF THE GUARD. *Until quite recently we used pens and paper and typewriters to write with, mostly because we knew how to use them. They have been good tools, but limited. You tend to make messes when you work with them, and getting rid of those messes makes extra work. Cut & Paste is an inexpensive and practical alternative. Because it is as easy to use as a typewriter, you really will use it. Which may make it the first sensible word processor for the home. Thus an alleged labor-saving device has come to a position where it really can save a significant amount of labor, i.e., yours.*

THE MEN WHO MADE CUT & PASTE. *The Linotype machine pictured here was the 19th century's most important contribution to word processing technology. It let typesetters compose and rearrange text in the form of metal castings. The importance of Cut & Paste, of course, must await the judgment of history. Nevertheless, the seven men who developed it look confident here. Standing left to right, they are: Norm Lane, Steve Shaw, David Maynard, Dan Silva, Steve Hayes and Jerry Morrison. Seated at the console is Tim Mott, whose idea this was in the first place.*

people who have in common a very lucid philosophy of design.

Computers and the programs they run are tools, they believe. Tools are never noticed unless they are bad tools. When they're good, they become, in effect, invisible. And if you want to make a good tool—an invisible tool—you'd best study the way people use the tools they already have.

As a result of this thinking, Cut & Paste was designed to work much in the same way that you already work with a typewriter or with pen and paper. The most complex and powerful parts of the program are hidden from view. The work they do takes place deep in the machine. All you get to see are the results.

But beyond that, there is something almost indefinable about a good design. Things about it just seem to work crisply. Little touches and features that you notice make you want to smile. If it's really good, it *feels* good.

Cut & Paste feels good.

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THE PRODUCTS *of Electronic Arts can be found in your favorite computer stores, software centers, and in leading department stores throughout the country. Both Cut & Paste and Financial Cookbook™ are now available at a suggested retail price of $50 for the Apple IIe and the Commodore 64 and will soon be available for the IBM-PC and Atari.*

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Cut & Paste is just one of a growing number of products we're publishing within the category of "home management software." These products are all built around the same program architecture, making them all equally "friendly," as well as remarkably straightforward and practical. We believe that designs like these will soon make home computers as functional and efficient as today's basic appliances.

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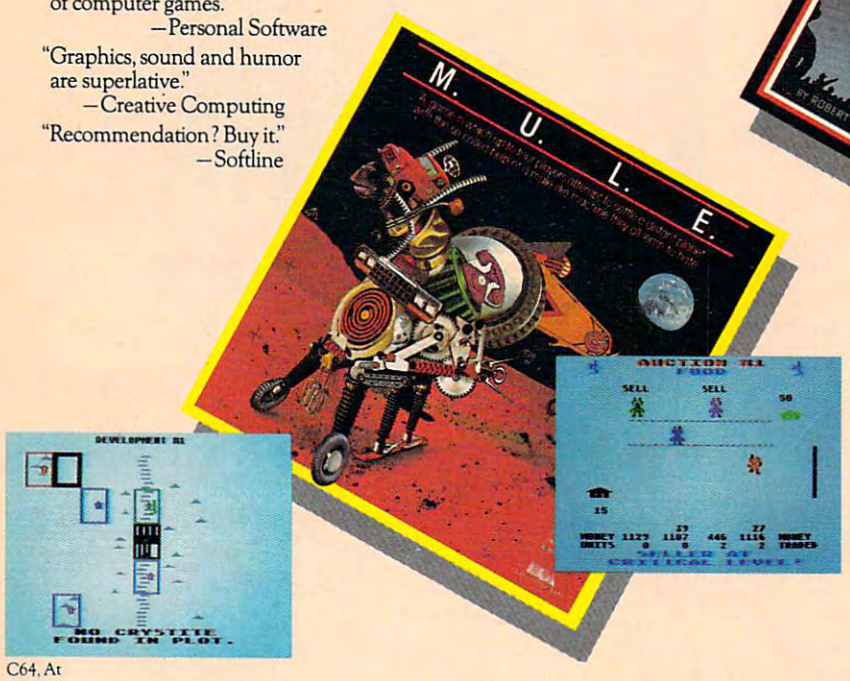

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there will be new "special input devices—maybe a keyboard, an alphanumeric keyboard, special controls. Synthesizers could become so standardized that they all become preset."

Hal Chamberlin looks for keyboards with more freedom, and falling prices for *performance* synthesizers. Synthesizers optimized for performance (as opposed to primarily *programmable* machines) will offer greater expressiveness, a more sensitive response to the player's hands. He's currently working on a keyboard which responds to the velocity with which a key is pressed, the amount of initial pressure, and the secondary pressure deriving from the motion of the fingers—three kinds of sensitivity at once.

Will Alexander is technical manager for Fairlight Instruments, a manufacturer of popular, high-end synthesizers. He sees several important developments over the next few years. For one thing, new technology will make the instruments more complex. They'll have "more memory, smaller packages, more voice generation capability (as in polyphony)." What is now layered sound on an eight-track recorder will be handled in one pass by a synthesizer. And we can probably also expect to hear more synthesizers in video and media applications.

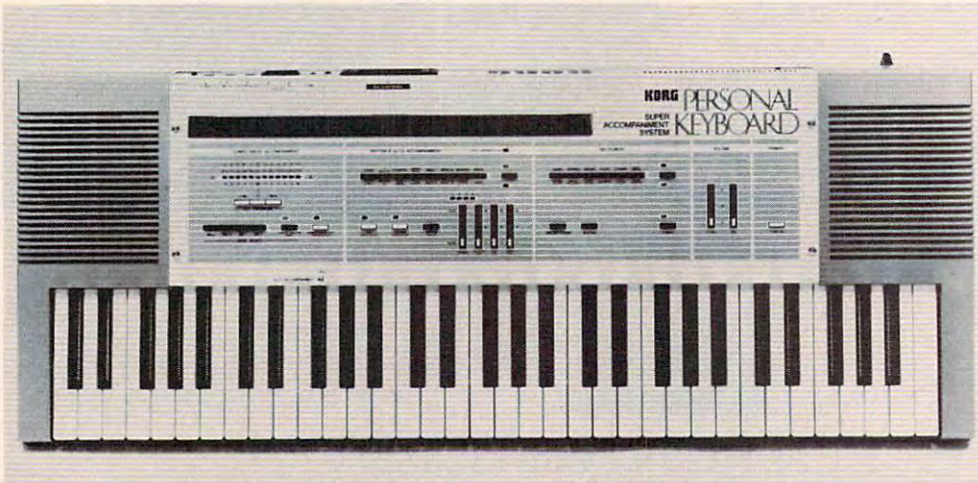
One interesting possibility is direct interfacing to personal computers. That would permit computer-generated graphics that illustrated the music. Alexander also believes that the now common restriction limiting many synthesizers to playing eight notes at once might well expand to 64 voice capability. The computer and its great mathematical capabilities make all this possible.

Victims of evolutionary pressure prepare to make music with portable Moog "Liberation" synthesizers.

An Invasion Of Numbers

Although it is at first hard to imagine the music of Vivaldi or The Talking Heads as a collection of numbers and equations, music is very much a part of the current trend toward digitization. And when something goes digital, you can expect to find a computer in there somewhere, keeping the numbers straight. It's a matter of speed, really—if you can sample something fast enough and then assign a number to each sample, you can store it and transmit it with no degradation in quality. Alexander notes that digital has "a transparent sound—it has no characteristics (unlike analog). It only produces what you program it to do."

Perhaps even more important to the creative musician, digitization permits an extraordinary range of sound timbres, rhythms, and harmonies. And while it can take years to learn to effectively play a violin, you can quickly pick up the skills necessary to program an artificial violin. On current analog synthesizers, the string section sounds pretty convincing. On digital synthesizers, you might well be hard-pressed to tell the difference.

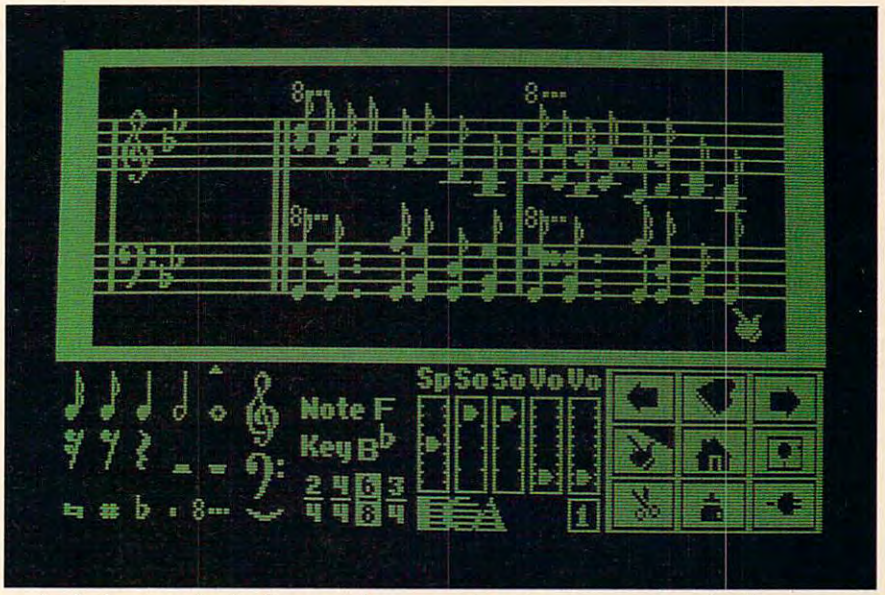


Korg's self-contained SAS-20 makes up rhythm, bass, and even chord progressions when you play a melody with one finger.

Of course, in many areas of modern life, digital is replacing the traditional analog approach. A tiny imitation of a Vivaldi concerto appears as the bumps in the grooves of a typical stereo LP record. The new laser discs contain only numbers. And the laser disc players are dedicated computers which can read those numbers at the rate of 44,000 per second.

The END of DINKETY-DINK.

Announcing the first computer music program that actually sounds like music.



LET'S FACE IT. Up till now, music programs for your home computer have all sounded, well, pretty lame. There were the ones that resembled little electronic music boxes, remember? And then there were those that sounded like so many burps.

Enter Music Construction Set.™ It's the first music program that really makes use of the power of that machine you've got. If you're a serious student, this means you'll be able to work with an intricacy and range of sound quality you've never heard before on a computer. And if you know nothing about music, you'll find something even more important. Namely, that this thing is simple enough to be a lot of fun.

Take a good look at this screen because it, you, and a joystick are the whole story here.

That's you at the right end of the staff of notes – the little hand. Move the joystick, and you move the hand. Use it to carry notes up to the staff. Lay in rests, signatures, clefs, then point to the little piano in the lower right and listen, because you'll hear the whole thing played back.

Move those little scales in the middle up and down to vary the music's speed, sound quality, and volume. Use the scissors to cut out whole measures, then use the glue pot to paste them in somewhere else. Got a printer? Great. Print the score out and show it off to your friends.

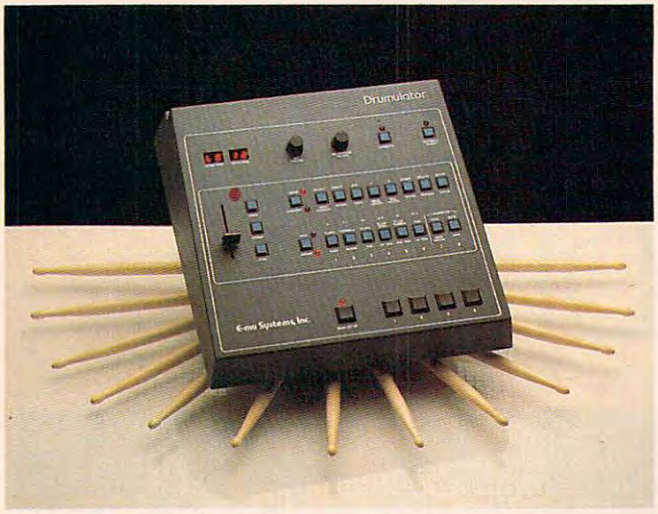
But what if you're not up to writing your own stuff yet? No problem. There are twelve pieces of music already in here, from rock 'n roll to baroque. They're fun to listen to, and even more fun to change. (Apologies to Mozart.)

The point is, the possibilities are endless. But if you're still skeptical, visit your nearest Electronic Arts dealer and do the one thing guaranteed to send you home with a Music Construction Set in tow.

Boot one up. Point to the piano. And listen.

ELECTRONIC ARTS™

MUSIC CONSTRUCTION SET is now available for Apple II, II+, IIe, and Commodore 64 computers. The Apple version, with a Mockingboard,™ plays chords of up to six notes each. The Commodore version plays chords of up to three notes each. Apple is a registered trademark of Apple Computer. Commodore is a registered trademark of Commodore Business Machines, Inc. For more information about Electronic Arts, write us at 2755 Campus Drive, San Mateo, CA 94403 or call (415) 571-7171.



E-MU Systems' Drumulator, containing digitized versions of real drum sounds.

Will Alexander states without equivocation that "digital is the wave of the future in music synthesis." His company's Fairlight synthesizer *is* a computer—it's got BASIC, FORTRAN, a word processor, and a light pen. And soon they're expecting to add the language C. The Fairlight has two microprocessors on the same bus—one for music composition and the other for input/output. He sees the availability and management of memory as a key to future synthesizer designs. At present, the Fairlight implements the concept of virtual memory storage; music can be performed while new music is overlaid in memory.

Most of today's synthesizers are analog. If you want a softer, more woodwind sound on one of these machines, you turn a dial controlling a built-in, filtered waveform until you get close to what you're after. Yamaha has recently introduced a relatively inexpensive digital synthesizer and—like anything digital—it isn't tuned, it's programmed.

Alexander forecasts the death of analog: "Analog has been taken to its limits ... the decisions are made for you." With digital, "the end user specifies the parameters—decisions are made by the user." Using analog, you work with a specific set of predefined harmonies; with digital, you specify the harmonies for the system. This gives the player more responsibility, but also far more freedom. The Fairlight, for example, has no oscillator—the user works directly with the waveform itself.

Playing an analog synthesizer, Alexander says, is like going to a paint store and just buying tubes of colors and supplies. Using a digital synthesizer is far more individual: Like a painter in the 15th century, you work from scratch, making your own paints, creating all your own colors.

Hal Chamberlin agrees, saying that analog synthesis will be dying out over the next several years. The only thing holding back further digital development is the cost and complexity of the technology. He says that the chip technology is already here—it's just a matter of implementation.

Tom Rhea, director of marketing for Moog Music, Inc., finds digital inevitable, but in its infancy. "Digital technology as it appears in musical instruments is not at a mature stage. What technology can do is known. What people need and want is the problem. There's a lot of hoopla over digital. It's another buzzword. For a while it was *polyphonic*, then *programmable*, now it's *digital*. But in ten or fifteen years we'll have digital everything. It's the music of the future."

Analog versus digital "should be a non-issue to a musician. The musician is concerned with 'What does the sound do? How can I manipulate it?' Nobody asks of a piano 'How are you constructed?' They just play and respond subjectively."

Paul Turino, an engineer in the product development division of Unicord, distributors of Korg machines, expects that the coming digital equipment will open many doors for musicians. "We'll see a greater utilization of microprocessor-based units. Presently, a synthesizer such as the Fairlight can record any sound imaginable and process it—as a result of sampling principles. In the future, synthesizers will be able to store more features and handle ten times the amount of routines that they handle now."

Dog Symphonies

You hear Fido howling at the moon. It's a haunting, pleasant sound. You quietly turn on your tape recorder and save the sound. The next morning, you plug the recorder into your synthesizer and *sample* the sounds. A computer inside the synthesizer makes a very accurate, high-resolution analysis of the noise. After that, you can play the howls in any key, add vibrato, decay, echo—whatever you want, to manipulate the sounds into new "instruments." Then layer your invented instruments, harmonize them, bring

A Commodore 64 interfaced to a pair of Prophets from Sequential Circuits.

* Popular Computing, November, 1982
† Apple Softalk, April, 1982

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one to the front as the melody, and you've created a dog orchestra.

Do you like Linda Ronstadt's voice? Sample it from the radio. Drive it through a singing speech synthesizer and you've got the services of a robot songstress at your command. Sampling is the hottest topic in synthesis today and it, too, is an offshoot of the digital revolution brought about by computerization.

You can pull a birdsong from the sky as easily as you could snap a picture of a bluebird in a tree. Sampling is a technique that digitizes a whole sound, says Moog, and any sound imaginable can be used. Fairlight's Alexander also feels that sampling is an extremely important technique, especially in the way it simplifies things for the musician.

It's not necessary to write a computer program to generate and manipulate a waveform. Just offer a sound to the machine and the computer figures out the equations for you, synthesizes the waveforms, and suddenly Linda or Fido is waiting inside the instrument. You can concentrate on writing a song for them because, as Alexander points out, with sampling there are no mathematics for the user to bother with.

To The Limits Of Your Talents

Tom Rhea sounds a cautionary note. Though synthetic music has great promise, he wonders if it will be abused. Playing the violin well "involves neuromuscular skills, technique, hours of time. With a synthesizer we just press buttons. Because we can do this, is this what we *should* be doing? Electronic instruments are dangerous—you can do so much for so little. With synthesizers it's easy, easy, easy to play badly. Everyone can play, sure, but can they play it well?"

Of course, this argument was raised by painters when the camera was invented. Eventually, photography became an alternative art form.

The computerization of music will—like any technology—have its drawbacks. But most people will welcome the exhilarating possibilities offered by these new, powerful music machines. There's something to be said for an instrument which lets you go quickly to the limits of your talents without having to spend years studying before finding out just how good you might be.

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COMMODORE 64
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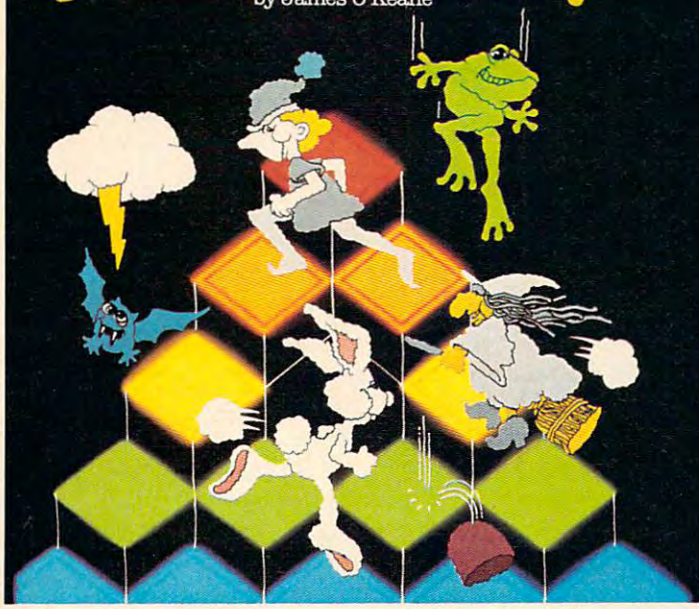
by James O'Keane



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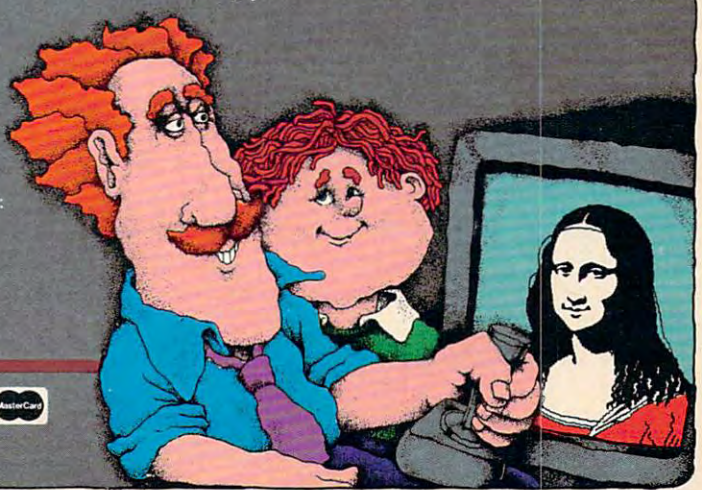

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Robots That Roll, Crawl, And Bounce

Fred D'Ignazio, Associate Editor

The World Headquarters For Robots

Where is the world headquarters for robots? Is it in Japan, England, the Soviet Union? Probably not. It's probably right here in the United States at the Robotics Institute. The institute is part of Carnegie-Mellon University, in Pittsburgh, Pennsylvania.

The Robotics Institute was established in 1979. Eighty scientists and engineers and over 60 students work on the institute's multimillion-dollar projects to invent new, advanced computers and robots. The institute's 17 corporate sponsors watch the research closely. They are hoping the scientists and students will invent robots and computers that their companies can use in their business.

A Robot That Crawls

All the robots at the institute are exciting, but the most interesting robots are the ones that move. There are three types of mobile robots: a wheeled robot named Rover, a six-legged robot that crawls, and a couple of bouncing robot pogo sticks.

The crawling robot is one of the first six-legged robots (or *hexapods*) in the world. Earlier hexapods were built in Japan and in the U.S. And there is even an octopod (an eight-legged robot), built by scientists in the Soviet Union.

In order to walk, the earlier hexapod robots divided up their six legs into two tripods of three legs each. To take a step they would raise three legs. To keep from falling they would keep three legs on the ground (in the shape of a triangle—or tripod). In this way, the hexapod could move, but it didn't need to maintain its balance since it always had three legs on the ground.

The institute's hexapod robot can walk using the tripod method. But it is capable of using other methods as well. Its inventor, Ivan Sutherland, studied the motion of several animals, including four-legged horses and six-legged insects. He programmed the robot to use some of the same patterns that real animals use.

Each of the six legs on the robot has its own microcomputer to control the leg. The computers communicate with each other and with a central supervisor computer to make sure the robot accomplishes its main objective: crawling. Without the computers working together, the robots' six legs would become jerky and spastic. Instead of walking it might begin doing deep knee bends or keel over.

A human can ride Sutherland's hexapod. Even though the robot has lots of little computers to help it walk, a human can do some important things to help the robot get where it's going. The rider can adjust the *attitude*, or tilt, of the robot so it won't tip over on hillsides or rocks. He can adjust the robot's clearance so that the robot doesn't scrape its tummy on sharp stones, tree branches, and other objects it passes over. And he can help the robot decide where to place its feet. This is especially important when the robot is walking near a hole, next to a cliff, or beside a puddle.

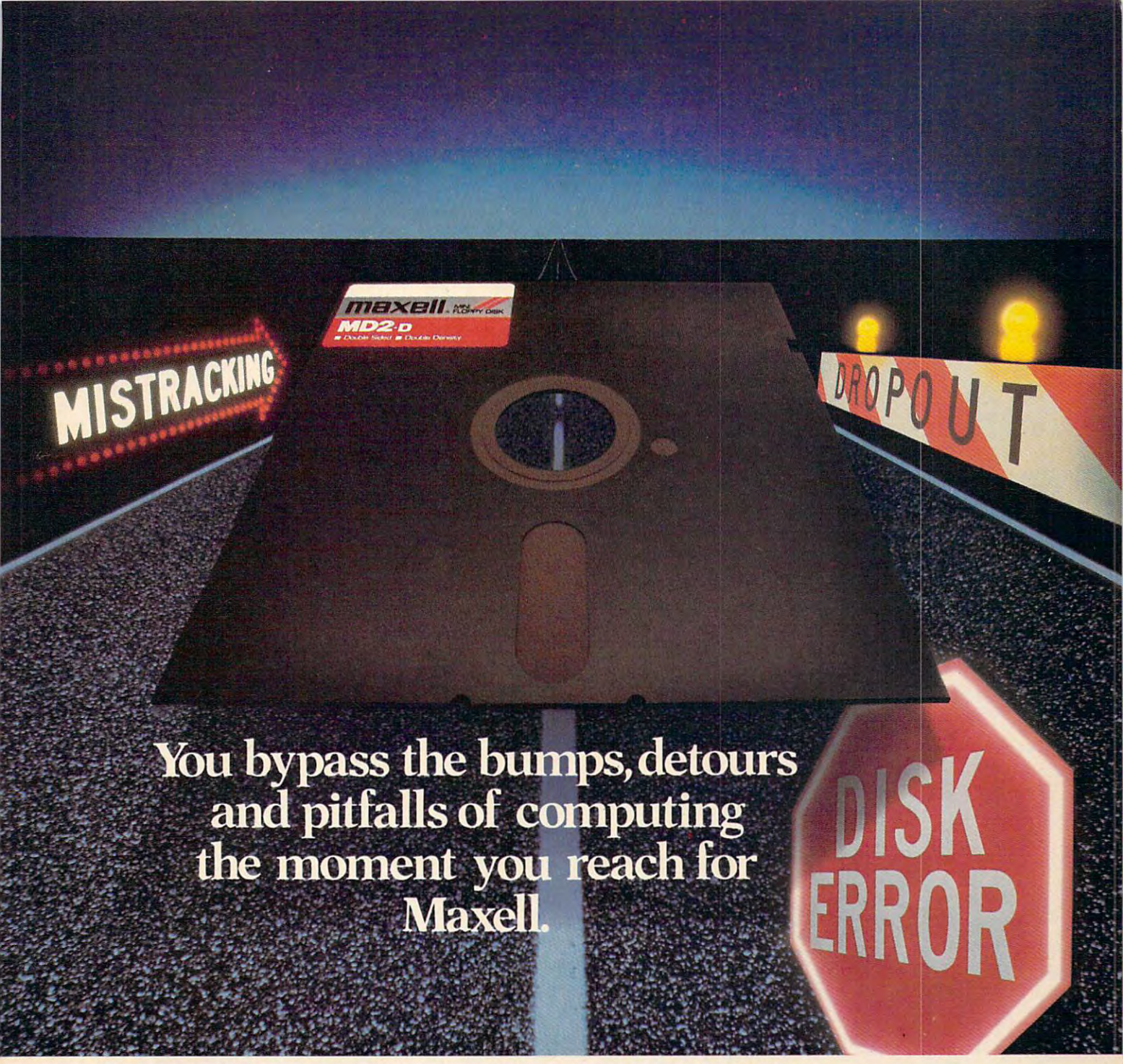
However, the most important reason to have a human ride on the robot is not to help it walk. It's to use the robot as an intelligent, legged jeep or land rover—to get somewhere that no wheeled vehicle could reach.

But don't expect to get there fast. Sutherland's hexapod travels at only two miles per hour.

A Robot That Bounces

Perhaps the strangest robot at the institute is Marc Raibert's bouncing pogo stick. The robot has no arms or head, only a body and a leg—*one leg*. The leg keeps its balance and moves forward by hopping, just like a kangaroo.

Raibert built the robot (or *monopod*) to help him study how creatures balance themselves. The



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A New Age Of Discovery

Someday, maybe 10 or 20 years from now, an exciting new Age of Discovery will begin. It will be comparable to the 1400s, 1500s, and 1600s, when European explorers spanned the globe. Yet most of the explorers this time won't be people, they'll be robots. Many of the robots will be descendants of the rolling, crawling, and hopping robots being developed at the Robotics Institute.

Today's robots are not very intelligent. Their senses are primitive, and their movements are jerky and limited. A robot "explorer" of today might not be able to find its way out of your bedroom.

But tomorrow's robots will be different. They will be smarter, more agile, and have advanced vision, hearing, touching, and other senses. They will still not be as sharp as a human being, but they will be far sturdier. They will be fabricated out of metal, durable plastic, and crystalline graphite. The robots will be able to survive in the extreme cold, the killing vacuum, and the awful radiation of outer space. They will be able to withstand the tons of pressure and cold, numbing water beneath the seas and the extreme heat under the earth's surface. They will go where no man or woman has gone before.

They will work in mines and factories on the far side of the moon, on Mars, on the moons of Saturn and Jupiter, in the Asteroid Belt, and in deep space.

They will dive to the bottom of the ocean, perform salvage operations on sunken ships, and mine and farm the ocean floor.

They will shrink down to microscopic size and become the eyes and fingers of surgeons as they travel on a fantastic voyage inside a person's veins, arteries, stomach, or lungs.

They will work in dark, dirty mines far beneath the ground, in erupting volcanoes, nuclear power plants, and amidst shrieking hurricanes. They will travel along miles of labyrinthine air ducts, sewers, and oil pipelines that are too narrow or too hazardous for human beings.

Robots will also work with human beings as their expert helpers and companions. Human beings and legged robots will scale tall mountains together, inspect and guard pipelines across the Arctic tundra, journey to the South Pole and through the unmapped interior of the Amazon jungle.

first version of his robot can fall down in only one direction since it is supported by a cushion of air blown out of a tilted wall to one side. A new version of the robot, now being built, will resemble a pogo stick wearing a bicycle helmet. The new robot will be able to balance entirely on its own.

It will be some time before one-legged, bouncing robots can leap tall buildings in a single bound. But Raibert's robot has already shown that it can leap onto curbs and over six-inch stacks of blocks.

The robot maintains its balance, even while jumping, by paying attention to a group of *sensors* (electronic senses) that send it information about its speed, the length and angle of its leg, and the texture and tilt of the surface it is hopping on.

The leg does not have its own onboard computer. Instead it functions on a "leash," an electronic tether attached to a high-speed computer in the lab. The robot's cord is actually more like an umbilical cord than a leash since the cord pipes in compressed air and pressurized oil, along with computer instructions. The robot uses the compressed air to power the leg and jump; it uses the pressurized oil to adjust the angle of its hips and leg to maintain its balance.

Sutherland's crawling boat and Raibert's bouncing pogo stick are a far cry from the walking robots in the *Star Wars* movies. But they are forerunners of robots of that size and complexity. Compared to factory robots that are bolted to the floor, these first legged robots are a great step forward.

The Robot Rover

There is another exciting robot at the Robotics Institute. It moves on old-fashioned wheels instead of legs. But it is one of the most advanced robots anywhere in the world. It is Hans Moravec's mobile robot Rover.

In shape and size, the Rover is a distant cousin of R2-D2. But it has more the appearance of a small barrel than that of a movie superstar. It is approximately one meter high, rests on three independently computer-controlled wheels, and is 50 centimeters in diameter. It is powered by six lead-acid batteries.

Atop Rover's head is a small model railroad track. On the track is a video camera resting on a little cart. The camera is Rover's lone "eye." But its eye can move up and down the track, swivel back and forth sideways, and tilt up and down.

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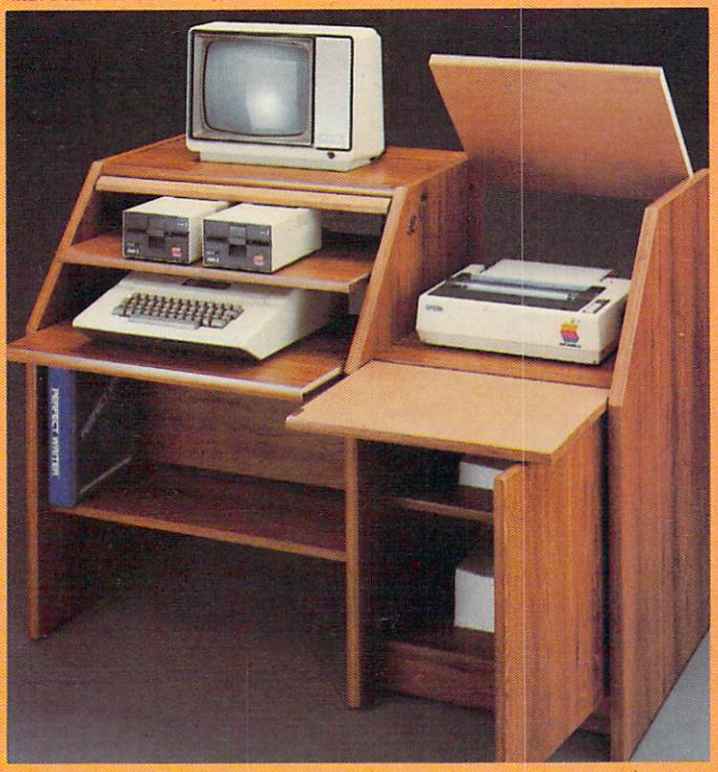

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Twist tabs on the back of the center panel allow for neat concealed grouping of wires while a convenient storage shelf for books or other items lies below.
The printer sits behind a fold down door that provides a work surface for papers or books while using the keyboard. The lift up top allows easy access to the top and rear of the printer. A slot in the printer shelf allows for center as well as rear feed printers.
Behind the lower door are a top shelf for paper, feeding the printer, and a bottom shelf to receive printer copy as well as additional storage.
Stand fits same computers as the CS-1632 as well as the Apple I and II, IBM-PC, Franklin and many others.
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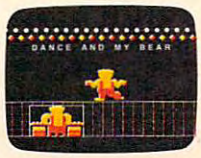

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With a quick signal from one of Rover's computers, the robot can swing its eye around and see in any direction.

Rover's guidance computer gets much of its information from the digitized patterns sent to it by the video camera. These patterns consist of tiny squares of light and shadow transmitted by the camera and translated by the computer into electronic bits of information. Together, the light and dark squares might represent a chair directly in front of Rover, or a person's knee. Rover's vision computer tries to decide which.

Rover has other ways of obtaining information about its world. It has an infrared sensor that detects the heat given off by different objects in the room. This sensor warns Rover if there is any danger of crashing into something.

And it has a bat-like sonar device that transmits a high-frequency sound wave, bounces it off a nearby object, and catches the wave when it returns, like a boomerang. A special *proximity* computer calculates how long it took the wave to make its complete trip. The result of this calculation is a new tidbit of information for Rover's guidance system. Now it knows how far it is from nearby objects. This enables it to plan how to get where it is going based on where it is now. It steers clear of any obstacles in its path.

Rover's 15 onboard computers let it do a lot of thinking on its own. But it still needs the help of a high-speed computer nearby to process the millions of bits of information that flood into its system from the TV camera. It sends this information over a UHF (Ultra-High Frequency, TV-like) channel. It gets the digested visual information back by way of an infrared wave transmitted by the computer. The infrared and UHF signals give Rover a lot more freedom. It can move about its world without being tethered by a wire to the computer (like the robot pogo stick). Robots with wires are somewhat free, but they often end up like a dog tied to a leash in the backyard—all tangled up.

One of the most interesting things about Rover is its control program, or rather its "orchestra" of programs. Rover's chief program is called the *conductor* because it coordinates all the other programs running on all the other computers. It must keep all the programs working in harmony, or Rover would crash into walls, fall off ledges, or maybe even stop working from total confusion.

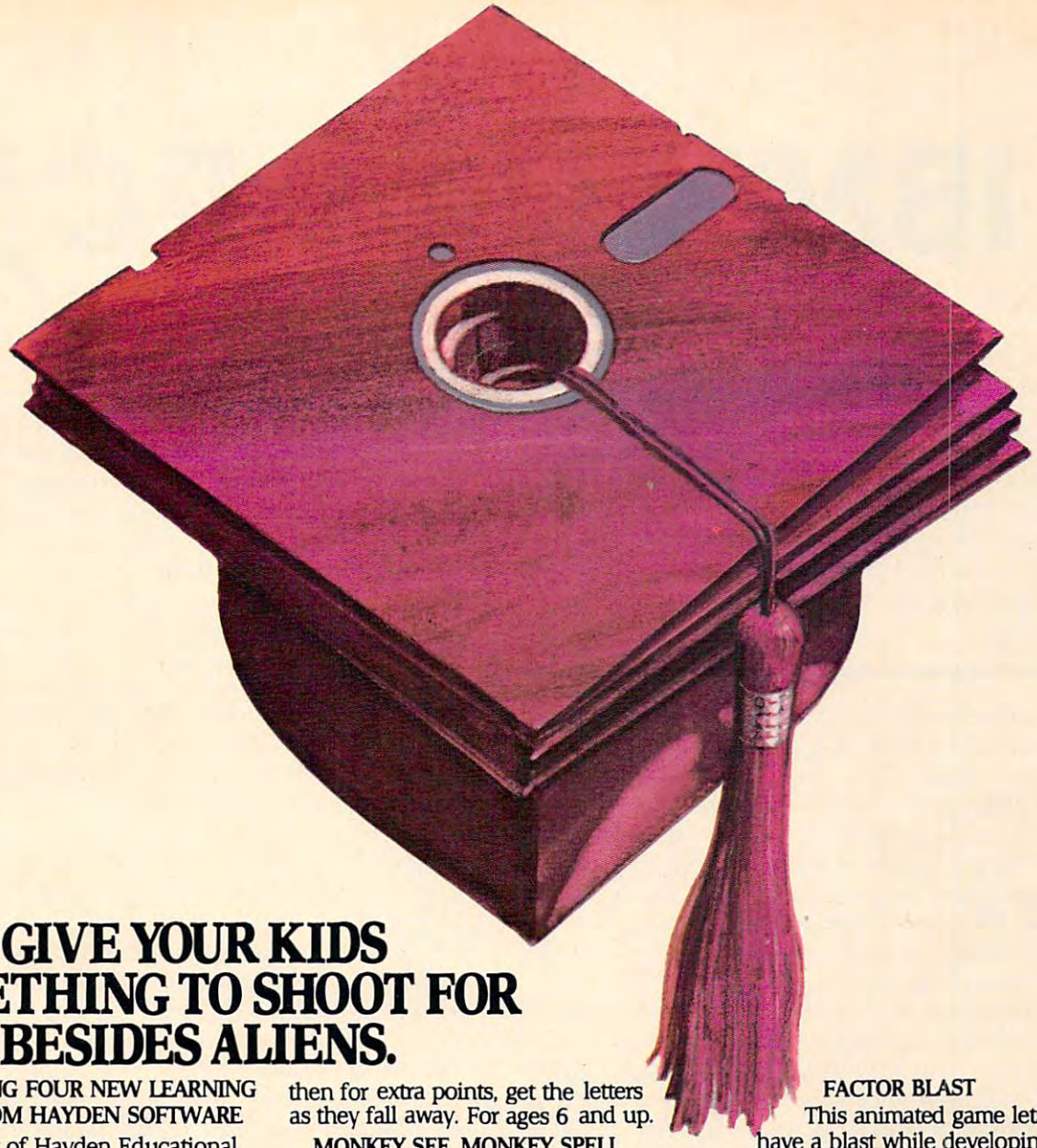
Rover uses an electronic "blackboard" to keep from getting confused. The blackboard handles all the messages sent by each computer to the central conductor computer and to all other computers. A special computer (a high-speed Motorola 68000 chip) stores the blackboard in Rover's memory. As new messages flash in, the computer posts them on the blackboard to share with all the other computers. This way, anytime one of Rover's computers wants information—say, on what Rover sees, or how far its wheels have turned, or what its current destination is—the computer just has to check on the blackboard.

Rovers Of The Future

Rover's inventor, Hans Moravec, had to wrestle with hundreds of problems every day, just to design Rover and build it from scratch. He had to worry about the type of motors used inside the Rover (brushless), the number of computers to include (15), how to program the computers (using a "blackboard" system), and how to send signals from the main computer to the Rover's onboard computers (by UHF and infrared signals).

Yet Moravec never loses sight of his long-range objectives. His current Rover is a prisoner of the laboratory. It couldn't survive in the real world just outside the laboratory door. But the Rover's descendants will venture far beyond the laboratory—deep under the ocean, down beneath the earth's surface, and far out into the unexplored reaches of the solar system and beyond.

Moravec is already designing new, improved Rovers of the future. And he is busy planning all the exciting things they will do. ©



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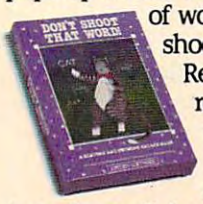

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Kids learn to spell by racing a monkey up and down a "letter" tree and grabbing those letters that spell the object shown at the bottom of the screen. Monkey See, Monkey Spell features six difficulty levels and a memory game. For ages 4 and up.

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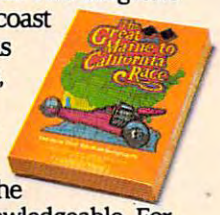

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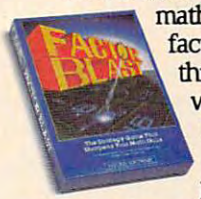

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Report On
IBM's New PCjr

Tom R. Halfhill, Features Editor

After months of incessant speculation and rampant rumors, IBM finally unveiled its new home computer in New York on November 1. The PCjr (code-named "Peanut" before its introduction) will be demonstrated at IBM dealers in December and available sometime in January. This report is a firsthand look at the machine which industry observers predict will be a significant development in the evolution of the home computer industry.

Never before in the history of personal computing (admittedly a brief history) has a product been so eagerly awaited by so many. The rumors of a forthcoming IBM home computer started more than a year ago, and every week seemed to bring another theory about what the computer would be like. Many of these theories contradicted each other. IBM stubbornly refused to confirm even the existence of such a machine, but nobody let that slow them down.

On one subject everyone seemed to agree: The introduction of a home computer by IBM—the company which is virtually synonymous with computers—would be a turning point in the history of the personal computer industry. First, there was IBM's traditional domination of the mainframe industry. Second, there was the phenomenal success of the IBM Personal Computer, which by itself has spawned a whole subindustry in PC compatibles, look-alikes, and add-ons. And third, since IBM's research and development budget is larger than the budgets of some small nations, there were high hopes that IBM would deliver a revolutionary machine that would reinvent the home computer.

After all these expectations, perhaps it's inevitable that the PCjr is a bit less than what some people expected for the money. But there seems little doubt that it will indeed be a commercial success and exert a major impact on home computing.

Truly A Junior PC

Much can be grasped from the name "PCjr," favored by IBM over the more flippant code name "Peanut."

Once you get past the obvious cosmetic differences, the closer you look at the PCjr, the more it resembles the full-grown PC. Rather than designing the PCjr from the ground up, IBM chose to start with a PC and scale downwards. In almost every sense, the PCjr is truly a junior PC. It is apparent that one of IBM's overriding design considerations was to retain as much compatibility as possible between the PC and PCjr, while protecting the PC's business market against competition from the PCjr. These considerations explain both the PCjr's capabilities and its limitations.

To preserve compatibility, both computers share the same 16-bit microprocessor chip for their Central Processing Unit (CPU), the Intel 8088. The floppy disk drives, disk format, and Disk Operating Systems (DOS) are virtually identical, so disks are completely interchangeable. The fundamental keyboard functions are the same. The BASIC languages are generally compatible. And the internal operating systems, too, are virtually identical. The PCjr even looks like a downsized PC, with a main "System Unit" and remote keyboard.

As a result, a very large proportion of existing PC software will run as is on the PCjr. In fact, according to IBM, about the only programs that won't work are those which exceed the limitations imposed on the PCjr as a scaled-down PC—mainly memory limitations and the single disk drive. Although the 16-bit CPU can address up to 1000K (one megabyte) of memory, IBM has limited the PCjr to a maximum of 128K addressable RAM. There are also no provisions for adding more than one disk drive. Therefore, any PC program which fits in 112K (video subtracts 16K overhead) and requires only one drive should run without modification on the PCjr.

Two Basic Models

IBM plans to market two configurations of the same basic computer, although the higher model is expected to account for at least 80 percent of sales. The only difference is that the upper model comes with twice as much memory, a built-in disk drive, 80-column video capability, and (of course) a higher price tag.

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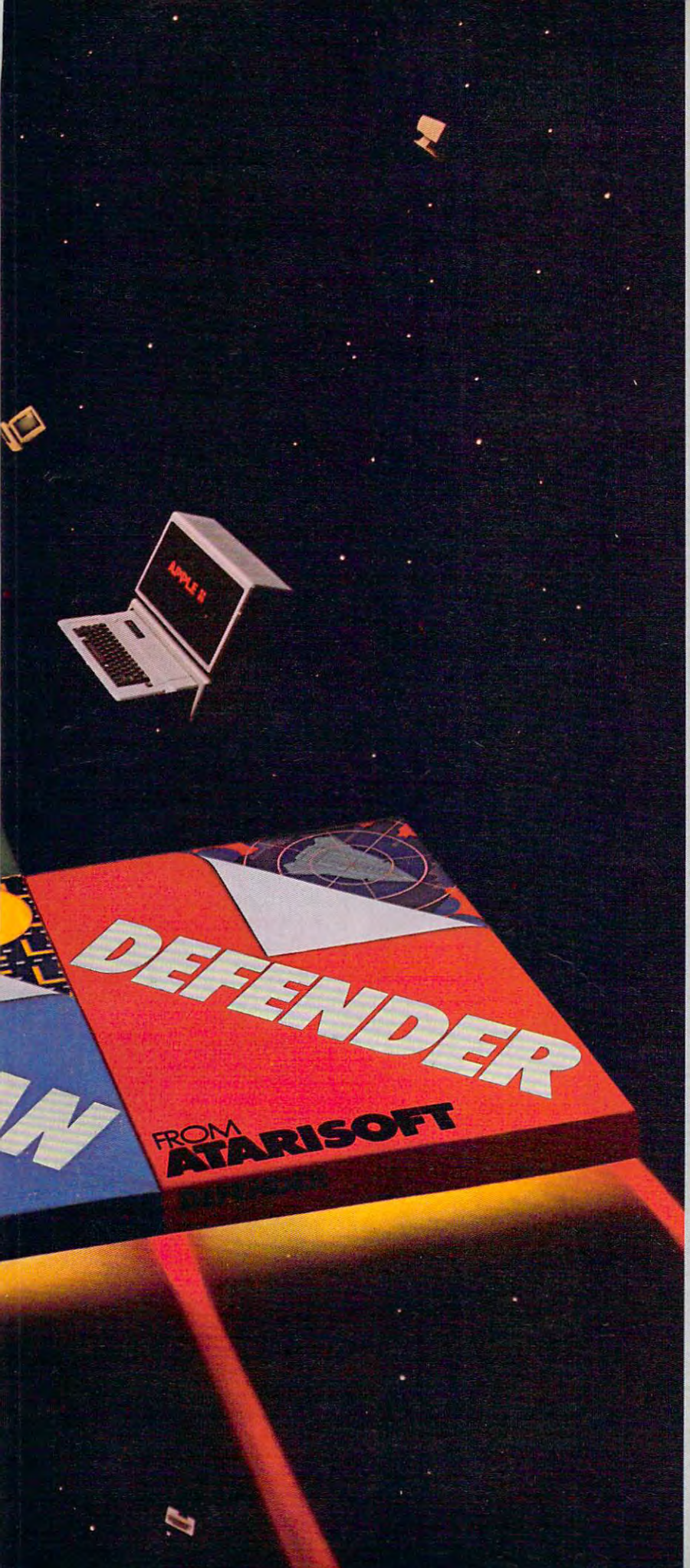

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ASM 3

The Entry Model can be upgraded to the Expanded Model by adding the 64K RAM/80-column video board ($140) and disk drive ($480).

The PCjr Entry Model, as it's called, retails for $669. It consists of a box-like System Unit (the actual computer), a remote cordless keyboard, and an external power transformer. The System Unit contains all the main circuit boards and chips, including 64K RAM and 64K of Read Only Memory (ROM). The 64K ROM includes a built-in Microsoft BASIC (referred to by IBM as "cassette BASIC"); the computer's main operating system, called BIOS (Basic Input/Output System); a self-testing diagnostic program activated when power is first switched on; and "Keyboard Adventure," a program which uses graphics to acquaint newcomers to the keyboard.

Like all home computers designed to work with ordinary TV sets, the Entry Model is limited to a 40-column-wide video display. An external RF modulator is required and costs $30 extra.

The Entry Model is designed to use cassettes for storing programs and data. Any standard, good-quality cassette recorder can be connected to the PCjr with an optional $30 cord. PC and PCjr cassettes are compatible. The data transfer rate is variable, but averages about 1200 baud (somewhat faster than a Commodore or Atari cassette recorder).

The PCjr Expanded Model ($1269) is identical except for an extra plug-in board which adds 64K RAM (for 128K total); switchable 40/80-column video capability (monitor required for 80 columns); and a double-sided, double-density 5¼" floppy disk drive built into the System Unit. The drive stores up to 360K per disk. The PCjr uses DOS 2.1 (available for $65), a slightly modified version of the current DOS 2.0. The Expanded Model also comes with two disks, "Exploring the PCjr," a tutorial, and "Your IBM PCjr Sampler," a collection of sample home application programs.

L For Later

Both versions of the PCjr have these features in common: two front-facing slots on the System Unit for plug-in program cartridges; an internal slot for a direct-connect, 300-baud modem card ($199); a serial port to which standard RS-232-C serial devices can be attached with an adapter cord ($25); rear connections for two analog-type joysticks ($80 per pair); light pen input; audio output jack; and outputs for both composite video and RGB (Red-Green-Blue) direct-drive video monitors. There's also an unused jack reserved for future expansion (labeled "L" for "Later," explained an IBM spokesman).

To add a parallel printer port, a snap-on interface ($99) attaches to the side of the System Unit. Internally, the PCjr System Unit has three slots: one for the modem card, one for the 64K RAM/80-column video board, and another for the disk drive controller card. The last two slots, therefore, are already occupied in the Expanded Model.

Infrared Keyboard

The most innovative feature of the PCjr is its cordless remote keyboard. Two tiny infrared "light bulbs" poking out the rear of the keyboard establish a remote link with an infrared sensor in the front of the System Unit. The lightweight (25-ounce) plastic keyboard, powered by four AA penlight batteries, can be operated up to 20 feet away from the System Unit. As long as the keyboard remains in line-of-sight of the System Unit, and within approximately a 60-degree arc of the infrared sensor, there are no clumsy cords to bother with. Keystrokes register on the screen reliably and instantly.

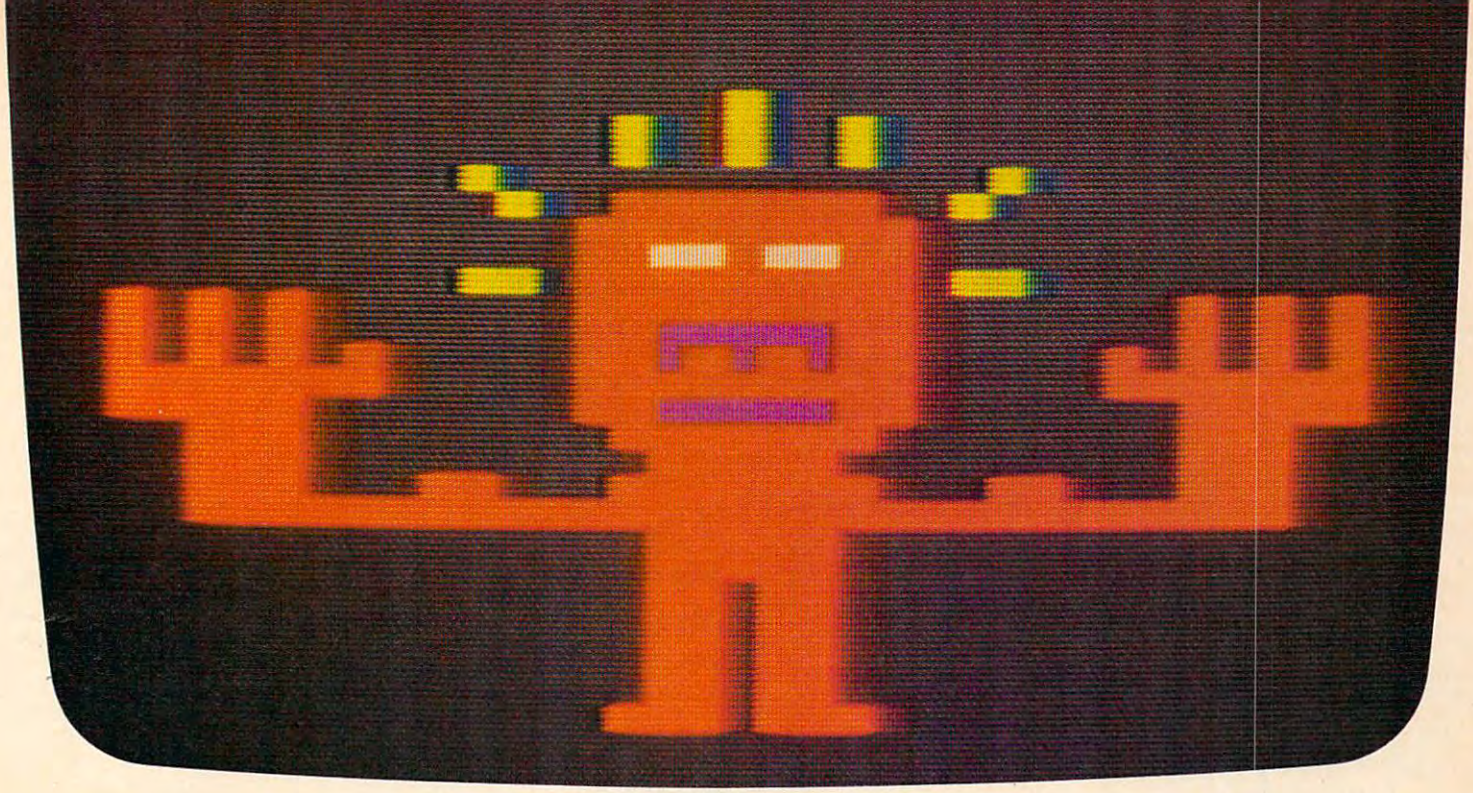
The PCjr constantly checks this invisible link and sounds a beeper if it's interrupted—for example, if someone walks between the keyboard and System Unit. IBM says the keyboard batteries should last for months with normal use. When they do begin to fail, the beeper will warn that keystrokes are not registering properly. Battery failures cannot erase programs or otherwise affect the computer.

If another PCjr is operated nearby, the keyboard can be hooked up to the System Unit with an optional cord ($20) to keep them from interfering with each other. (Incidentally, IBM says the PC keyboard is not compatible with the PCjr.)

Aside from its cordless convenience, the PCjr keyboard itself is somewhat disappointing for a computer in its price range. Perhaps to encourage some people to buy a PC instead of a PCjr, the PCjr keyboard consists of 62 small, flat, plastic calculator-style keys, similar to the so-called "chiclet" keyboards found on low-end home computers. It feels much like a TRS-80 Color Computer keyboard, except the keys are rectangular instead of square.

Also, the keycaps are totally blank—all the lettering is squeezed onto the keyboard surface between the keys. The lettering is crowded and difficult to read in places because some keys have multiple functions. For example, the PCjr lacks the ten special function keys found on the PC. Instead, the PCjr combines the special function keys with the numeral keys, accessed by first pressing a CONTROL-type function key. The PC's separate numeric keypad also is eliminated on the PCjr. However, the PCjr retains the four cursor keys arranged in a handy diamond pattern.

The PCjr's calculator-style keyboard does allow keyboard overlays, not possible on regular typewriter-style keyboards. Since the entire keyboard is redefinable, you can program any



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Color, Graphics, Sound

To keep things as compatible as possible, the PCjr's sound and graphics are basically the same as those on a PC equipped with a color graphics card. The PCjr does have additional color graphics modes and sound capabilities, but they require a $75 extended Microsoft BASIC cartridge to access. The 32K cartridge plugs into one of the two front slots on the System Unit and adds numerous graphics and sound commands.

Without the BASIC cartridge, the PCjr Entry Model has two high-resolution graphics modes: 320 × 200 pixels with four colors, and 640 × 200 pixels with two colors (the latter mode requires a monitor for legible resolution). Sound consists of a PC-type beeper (similar to the Apple II) and a second internal alarm beeper. The System Unit actually contains a more sophisticated sound chip, but the standard BASIC lacks the sound commands to use it.

Adding the BASIC cartridge to the Entry Model allows access to a medium-resolution graphics mode (160 × 200 pixels with 16 colors) and the sound chip. The sound chip has three tone generators covering seven octaves for music, plus white noise for sound effects, with 16 volume levels (similar to the Commodore VIC-20).

The PCjr Expanded Model offers more colors in the high-res graphics modes: 16 colors in the 320 × 200-pixel mode, and four colors in the 640 × 200 mode. The commands WIDTH 40 and WIDTH 80 switch between the 40- and 80-column text modes.

All of the graphics modes can display any of the PCjr's 16 colors, within the limits explained above. IBM says the PCjr has no sprites (also known as player/missile graphics) for animating objects on the screen. However, some animation is possible via "screen flipping"—drawing an alternate screen in memory while another screen is being displayed, then flipping instantly to the second screen.

A Luxurious BASIC

Thanks to the PCjr's Microsoft BASIC, it should be fairly easy to convert straightforward BASIC programs written for other computers to the new IBM. Some commands, such as CLS for "clear screen," resemble TRS-80 BASIC keywords.

It's also a very luxurious BASIC. Most home computers, including the Atari and Commodores, have 8K BASICs in ROM (Applesoft is 12K). IBM says the PCjr's built-in BASIC is 32K long, and the extended BASIC cartridge adds another 32K. This huge BASIC includes commands that are separate utilities on most other home computers, such as RENUM, for renumbering BASIC program statements; DELETE, for deleting ranges of BASIC lines; TRON (Trace On) and TROFF (Trace Off), a powerful debugging tool which lists line numbers on the screen as they are executed; FILES, to list the disk directory; and KILL, to scratch disk files.

Because of the 16-bit CPU's megabyte of address space, it was possible to add this large BASIC without mapping out any RAM. BASIC uses only a few kilobytes of RAM for overhead. However, IBM says the BASIC cannot address more than 64K, even in the 128K Expanded Model PCjr. The Expanded Model with cartridge BASIC leaves only 60130 bytes free for BASIC programming. The 64K Entry Model, without adding cartridge BASIC, has about 45K free.

An Open Computer

IBM says the PCjr is an "open architecture machine," meaning that full technical information will be available to independent software/hardware developers and users. This is to encourage third-party software and accessories. Expect to see a busy market in replacement keyboards, multiple disk drives, combination boards to make the most of the PCjr's three internal slots, and possibly expansion beyond 128K RAM.

IBM has a few peripherals of its own ready, plus some home software written by outside companies (albeit wrapped in IBM packaging). Besides the joysticks and modem card, IBM introduced a PCjr carrying case ($60) and the IBM PC Compact Printer ($175). This is an 80-column thermal printer, friction or tractor feed, which prints at 50 characters per second.

IBM says the PCjr will be sold only at IBM Product Centers and authorized IBM dealers, not mass-marketed through department stores and discount chains like other home computers.

Because of its narrower distribution, and also because of its much higher price, it seems likely that the PCjr will split the home computer market into two levels. With Texas Instruments off the scene, Commodore and Atari will battle for domination of the low-end market. Despite ominous predictions by some industry observers, the PCjr should not significantly cut into this under-$300 segment. Instead, it will compete more directly with the Apple and Atari's announced high-end models. The Coleco Adam probably will be considered a low-end computer in terms of price, because a complete system costs less than a bare PCjr Entry Model.

Nevertheless, the PCjr's impact will be felt at all levels of the home market. Those in search of elusive standards may settle on the PCjr, as they seem to be doing with the PC. It's also likely that lower-priced PCjr-compatibles will surface before long, perhaps even from Commodore or Atari. ©

INSTA

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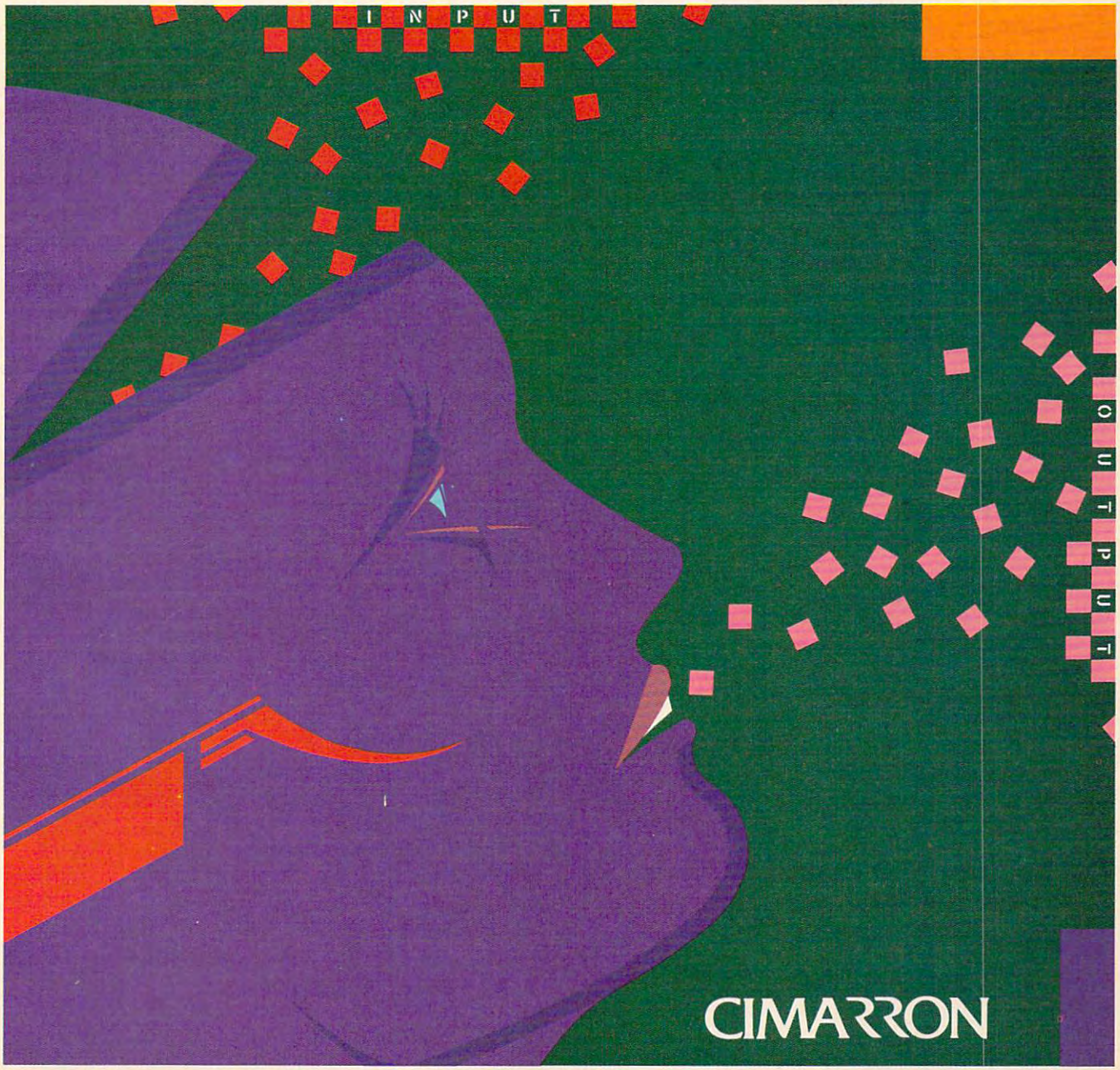

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Micro Mechanic

Robert L. Wright

This program makes it easy to keep up with automobile maintenance schedules, which are very important to your car's health and well-being. The original version runs on all Commodore computers. And versions for Atari, TI-99/4A, Apple, and Radio Shack Color Computer are included. A printer is required.

Few things are more important to the reliable operation of an automobile than performing routine maintenance on schedule. Failing to regularly change the oil or check the brake fluid could lead to major mechanical problems or even serious accidents. Unfortunately, most drivers have difficulty keeping up with just what should be done when. That's where "Micro Mechanic" can be of assistance. Your computer is much better than you at remembering such details.

When RUN, Micro Mechanic will ask for the current mileage on the car. It will then find when the next maintenance is scheduled and offer to print a checklist of the items called for at that mileage. If you are within a few hundred miles of the scheduled mileage, or if you've gone past the scheduled mileage, you'll want to print a copy. After you've completed and checked off all the required items, the list can serve as a record of the maintenance. These records could then be used to prove that you've taken good care of your vehicle, which should substantially improve its resale value.

Customizing The Program

Micro Mechanic is written to be as flexible as possible. No two models have exactly the same maintenance requirements, so you will almost certainly have to modify the program for your own needs. In fact, if you have more than one car, you'll probably want to prepare a version of Micro Mechanic for each.

You can find the information for customizing the program in your owner's manual. More than likely, it contains a chart explaining when certain types of maintenance should be performed. These should occur at regular intervals. In the programs, these intervals are defined in line 110 (lines 100–110 in the TI Version).

For my car, the basic maintenance interval (I1) is 7500 miles. Every 7500 miles my car requires a change of oil and a check of the cooling system. I call these Interval 1 maintenance items, and they are defined in lines with numbers in the 4000 range. Every second 7500 miles, that is, every 15000 miles (I2), certain additional checkups are required. Call these Interval 2 maintenance items; they're defined in lines with numbers in the 3000 range. Then, every fourth 7500 miles (every 30000 miles [13]), other maintenance is called for in addition to the Interval 1 and Interval 2 items. These are Interval 3 maintenance items, and are defined in lines with numbers in the 2000 range. Note that the program assumes that I2 and I3 are even multiples of I1, but for most cars this is a valid assumption.

In addition to the maintenance which my car requires every 7500, 15000, and 30000 miles, other types of checks are called for at 50000 mile intervals (I4). The addition of an interval which is not an even multiple of the basic interval (I1) complicates the program significantly. If your car requires no maintenance at intervals which are not multiples of I1, you can streamline your version of Micro Mechanic by omitting lines 210–230, 340, 380 (except in the TI version), 400–420, and all lines with numbers in the 5000 range. On the other hand, use these lines as a guide if additional nonstandard intervals must be included.

To customize Micro Mechanic for your own use, change the intervals I1–I4 to match your car's requirements. Then add, delete, or modify the

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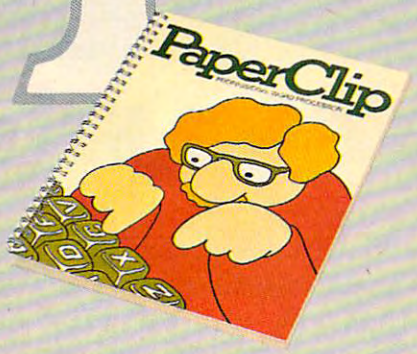
1



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2

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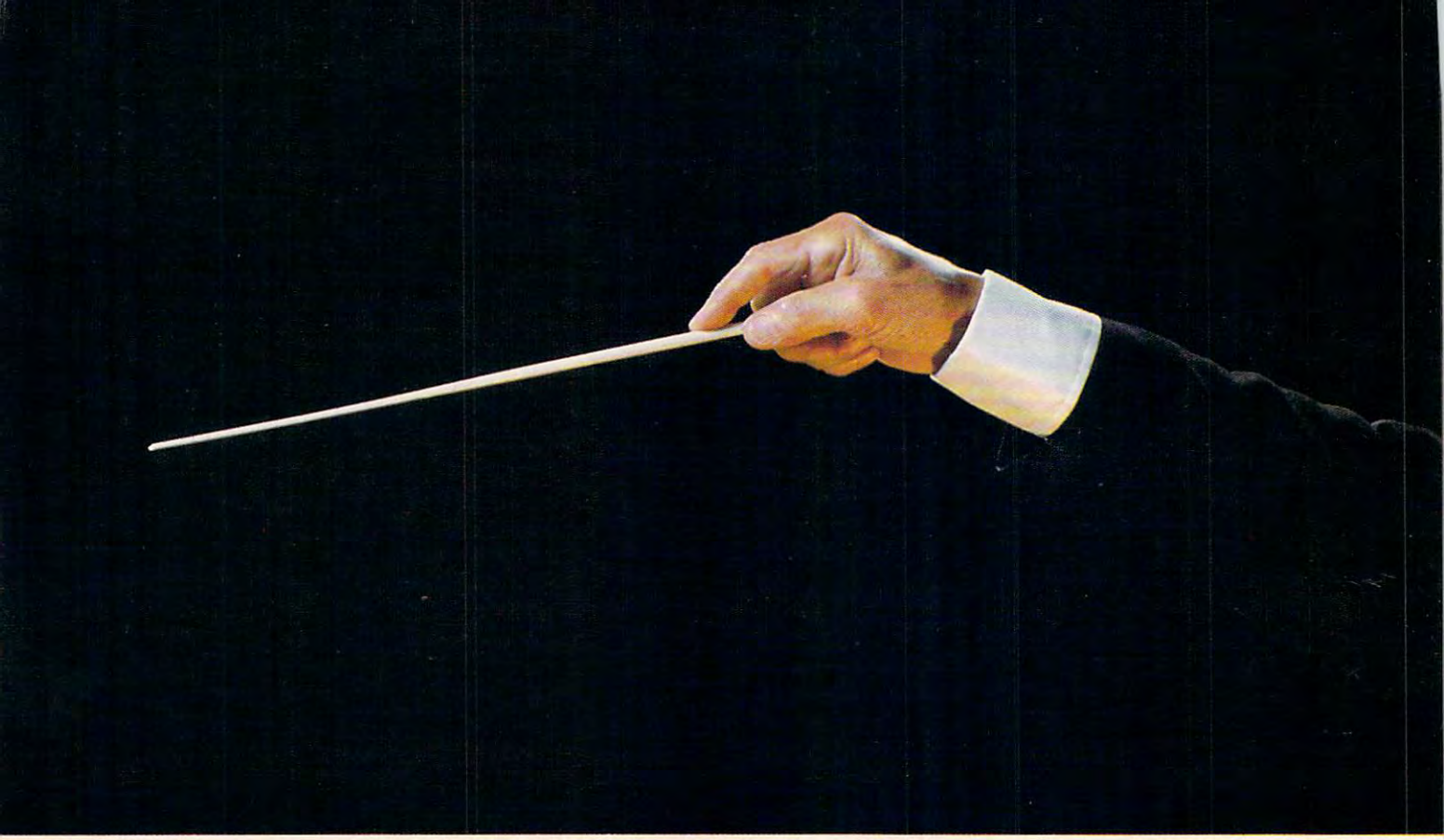

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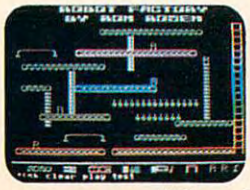

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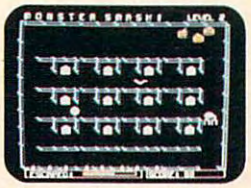

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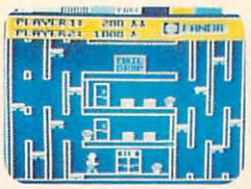

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Sample Checklist (VIC Version)

```
VEHICLE MAINTENANCE CHECKLIST FOR DODGE COLT

MILEAGE: 15238              DATE: _____

SCHEDULED MAINTENANCE FOR  15000  MILES

└┘ REPLACE OIL FILTER
└┘ CHECK VALVE CLEARANCE
└┘ CHECK EXHAUST SYSTEM
└┘ CHECK CLUTCH PEDAL FREE PLAY
└┘ CHECK V-BELT ADJ & CONDITION
└┘ CHECK LIGHTS AND SWITCHES
└┘ CHECK HEADLIGHT AIM
└┘ CHECK WINDSHIELD WIPERS & WASHER
└┘ CHECK BATTERY
└┘ CHECK CHARGING & STARTING SYSTEM
└┘ CHECK BRAKE FLUID LEVEL
└┘ CHECK BRAKE PADS
└┘ CHECK BRAKE ADJ (PEDAL HEIGHT)
└┘ CHECK BRAKE LINES & HOSES
└┘ CHECK BRAKE LIGHTS
└┘ CHECK TIRES, WEAR, DAMAGE, AIR PRESSURE
└┘ CHECK BALL JOINT & TIE ROD DUST SEALS
└┘ CHECK STEERING PLAY
└┘ CHECK STEERING GEAR BOX BOOTS
└┘ CHECK WHEEL CAMBER & TOE
└┘ LUBRICATE DOOR HINGES & CHECKS
└┘ LUBRICATE HOOD, TRUNK HINGES & LOCKS
└┘ LUBRICATE THROTTLE LINKAGE, CLUTCH LINKAGE, ETC.
└┘ CHANGE ENGINE OIL
└┘ CHECK COOLING SYSTEM

NEXT MAINTENANCE DUE AT 22500 MILES
```

PRINT# statements to properly describe the maintenance which must be performed at the various intervals. Note that the line after the last maintenance item in the 4000 and 5000 line ranges must be a RETURN statement (see lines 4100 and 5100 in Program 1, for example).

Program 1 will work on all Commodore computers, except for the graphics characters used in the PRINT# statements to draw the boxes on the checklist and for the underlining in line 1020. They are for the 64 and VIC-20, and will have to be modified for PET/CBMs. If you have a VIC or 64 with an RS-232 printer attached to the user port as device 2 (instead of to the serial port as device 4), you'll have to change line 100 to match your configuration. For example, if your printer is set for 600 baud and no parity, you might use:

```
100 OPEN 1,2,0,CHR$(7)+CHR$(0)
```

See your *Programmer's Reference Guide* for more information on setting up RS-232 communication.

If you are using the TI-99/4A version (Program 3), you may need to change the OPEN statement in line 1000 to suit your particular printer configuration.

Programming Details

After setting up variable values and asking for initial information (lines 100–150), the program goes through a loop (lines 160–190) to determine the nearest multiple of I1 mileage for which maintenance is scheduled. The current mileage (MC) can be as much as 1000 miles greater than a scheduled mileage and still be within range (line 170, 175 in the TI version). The upper limit of 29 on the variable J in line 160 means that the program will work for cars with up to 226000 miles. This can be increased if necessary, but note that I1 times the maximum value of J in line 160 must be roughly equal to I4 times the maximum value of J in lines 210 and 400, so you will have to adjust those lines as well.

Lines 210–230 check to see if some multiple of the I4 mileage interval lies within the selected interval. If so, the scheduled mileage (MS) is adjusted accordingly, and the maintenance schedule variable (SC) is set to indicate that the Interval 4 list of maintenance items should be printed. If the current mileage is greater than the mileage for the scheduled work, line 240 sends the program to line 260 to print the appropriate message. Otherwise, line 250 tells you how many miles until the next maintenance is due. Lines 270–310 then give you the option of printing a checklist. If you do not wish to print, line 320 CLOSEs the channel to the printer before ENDing, to provide an orderly exit.

Line 330 calls a subroutine at line 1000 to print a heading for the checklist, then lines 340–380 determine which sets of maintenance items will be printed. Note that there is only one RETURN from the ON-GOSUB in line 390, at the end of the Interval 1 items in line 4100. This means that for mileages which are even multiples of interval I2 (SC = 2), both the Interval 2 items (lines 3000–3220) and Interval 1 items (lines 4000–4010) will be printed. For I3 intervals (SC = 3), all the items from lines 2000–4010 are printed.

Line 340 will cause the Interval 4 items (lines 5000–5080) to be printed if necessary. Placing this statement before lines 350–370 insures that if the I4 interval is also a multiple of I1 (as is the case for 150000 miles in the current version of Program 1), the Interval 4 items will be printed along with the Interval 1–3 items.

Lines 400–450 contain the necessary logic for determining the next mileage at which maintenance is scheduled (MN). The result is printed at the bottom of the checklist as a reminder. Line 460 CLOSEs the channel to the printer and ENDs the program.

Program 1:

Micro Mechanic For Commodore Computers

```
100 OPEN 1,4
110 I1=7500:I2=15000:I3=30000:I4=50000
120 PRINT"{CLR}":PRINT:PRINT"MICRO MECHAN
    IC":PRINT
130 PRINT"MODEL OF CAR":INPUT M$:PRINT
140 PRINT"CURRENT MILEAGE":INPUT MC
150 PRINT:PRINT
160 FOR J=0 TO 29
170 M1=I1*J:M2=I1*(J+1)+1000
180 IF MC>=M1 AND MC<=M2 THEN 200
190 NEXT
200 MS=M1+I1:MN=MS
210 FOR J=1 TO 4:MT=I4*J
220 IF (MT+1000)>=MC AND MT<=MS THEN MS=M
    T:SC=4:GOTO 240
230 NEXT
240 IF MC>MS THEN 260
```

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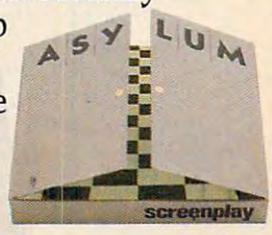


Asylum runs in 48K on the Atari, Commodore 64 and IBM PC computers. See your local software dealer. $29.95.

screenplay

Box 3558, Chapel Hill NC 27514 800-334-5470

You could win $10,000 from Screenplay anywhere our games are sold.

```
250 PRINT"MAINTENANCE DUE IN":PRINT MS-MC
    ;"MILES":GOTO 270
260 PRINT MS;"MI MAINTENANCE":PRINT"IS";M
    C-MS;"MILES OVERDUE"
270 PRINT:PRINT"PRESS:":PRINT:PRINT"
    {4 SPACES}{RVS}P{OFF} TO PRINT":PRINT
    "{6 SPACES}CHECKLIST"
280 PRINT:PRINT"{4 SPACES}{RVS}E{OFF} TO
    {SPACE}END PROGRAM"
290 GET K$:IF K$="" THEN 290
300 IF K$="P" THEN 330
310 IF K$<>"E" THEN 290
320 CLOSE 1:END
330 GOSUB 1000
340 IF SC=4 THEN GOSUB 5000
350 IF INT(MS/I3)=(MS/I3) THEN SC=3:GOTO
    {SPACE}390
360 IF INT(MS/I2)=(MS/I2) THEN SC=2:GOTO
    {SPACE}390
370 IF INT(MS/I1)=(MS/I1) THEN SC=1:GOTO
    {SPACE}390
380 GOTO 440
390 ON SC GOSUB 4000,3000,2000
400 FOR J=1 TO 4:MT=I4*J
410 IF (MN+I1)>MT AND MN<MT THEN MN=MT:GO
    TO 440
420 NEXT
430 MN=MN+I1
440 PRINT#1,"":PRINT#1,"NEXT MAINTENANCE
    {SPACE}DUE AT";MN;"MILES"
450 PRINT#1,""
460 CLOSE 1:END
999 REM ** HEADING FOR CHECKLIST
1000 PRINT#1,"VEHICLE MAINTENANCE CHECKLI
     ST FOR ";M$
1010 PRINT#1
1020 PRINT#1,"MILEAGE:";MC,"DATE:{13 @}
     "
1030 PRINT#1
1040 PRINT#1,"SCHEDULED MAINTENANCE FOR "
     ;MS;" MILES"
1050 PRINT#1
1100 RETURN
1999 REM ** INTERVAL 3 MAINTENANCE ITEMS
2000 PRINT#1,"L{@}@ CLEAN CARBURETOR CH
     OKE MECHANISM & LINKAGE"
2010 PRINT#1,"L{@}@ REPLACE AIR FILTER"
2020 PRINT#1,"L{@}@ REPLACE SPARK PLUGS
     "
2030 PRINT#1,"L{@}@ REPLACE V-BELT"
2040 PRINT#1,"L{@}@ DRAIN FLUSH & REFIL
     L COOLING SYSTEM"
2050 PRINT#1,"L{@}@ CHECK BRAKE FLUID L
     EVEL & CHECK FOR LEAKS"
2060 PRINT#1,"L{@}@ CHECK REAR BRAKE LI
     NINGS & WHEEL CYLINDERS"
2070 PRINT#1,"L{@}@ CHECK REAR WHEEL BE
     ARING FOR GREASE LEAKS"
2999 REM ** INTERVAL 2 MAINTENANCE ITEMS
3000 PRINT#1,"L{@}@ REPLACE OIL FILTER"
3010 PRINT#1,"L{@}@ CHECK VALVE CLEARAN
     CE"
3020 PRINT#1,"L{@}@ CHECK EXHAUST SYSTE
     M"
3030 PRINT#1,"L{@}@ CHECK CLUTCH PEDAL
     {SPACE}FREE PLAY"
3040 PRINT#1,"L{@}@ CHECK V-BELT ADJ &
     {SPACE}CONDITION"
3050 PRINT#1,"L{@}@ CHECK LIGHTS AND SW
     ITCHES"
3060 PRINT#1,"L{@}@ CHECK HEADLIGHT AIM"
3070 PRINT#1,"L{@}@ CHECK WINDSHIELD WI
     PERS & WASHER"
3080 PRINT#1,"L{@}@ CHECK BATTERY"
3090 PRINT#1,"L{@}@ CHECK CHARGING & ST
     ARTING SYSTEM"
3100 PRINT#1,"L{@}@ CHECK BRAKE FLUID L
     EVEL"
3110 PRINT#1,"L{@}@ CHECK BRAKE PADS"
3120 PRINT#1,"L{@}@ CHECK BRAKE ADJ (PE
     DAL HEIGHT)"
3130 PRINT#1,"L{@}@ CHECK BRAKE LINES &
      HOSES"
3140 PRINT#1,"L{@}@ CHECK BRAKE LIGHTS"
3150 PRINT#1,"L{@}@ CHECK TIRES, WEAR,
     {SPACE}DAMAGE, AIR PRESSURE"
3160 PRINT#1,"L{@}@ CHECK BALL JOINT &
     {SPACE}TIE ROD DUST SEALS"
3170 PRINT#1,"L{@}@ CHECK STEERING PLAY
     "
3180 PRINT#1,"L{@}@ CHECK STEERING GEAR
      BOX BOOTS"
3190 PRINT#1,"L{@}@ CHECK WHEEL CAMBER
     {SPACE}& TOE"
3200 PRINT#1,"L{@}@ LUBRICATE DOOR HING
     ES & CHECKS"
3210 PRINT#1,"L{@}@ LUBRICATE HOOD, TRU
     NK HINGES & LOCKS"
3220 PRINT#1,"L{@}@ LUBRICATE THROTTLE
     {SPACE}LINKAGE, CLUTCH LINKAGE, ETC.
     "
3999 REM ** INTERVAL 1 MAINTENANCE ITEMS
4000 PRINT#1,"L{@}@ CHANGE ENGINE OIL"
4010 PRINT#1,"L{@}@ CHECK COOLING SYSTE
     M"
4100 RETURN
4999 REM ** INTERVAL 4 MAINTENANCE ITEMS
5000 PRINT#1,"L{@}@ CHECK IGNITION TIMI
     NG & ADJ AS REQUIRED"
5010 PRINT#1,"L{@}@ REPLACE FUEL FILTER
     "
5020 PRINT#1,"L{@}@ CHECK FUEL SYSTEM F
     OR LEAKS"
5030 PRINT#1,"L{@}@ CHECK IGNITION CABL
     ES & REPLACE AS REQUIRED"
5040 PRINT#1,"L{@}@ CHECK FUEL, WATER &
      FUEL VAPOR HOSES & REPLACE AS REQUI
     RED"
5050 PRINT#1,"L{@}@ CHECK CRANKCASE EMI
     SSION CONTROL SYSTEM & CLEAN AS REQU
     IRED"
5060 PRINT#1,"L{@}@ CHECK EVAPORATIVE E
     MISSION CONTROL SYSTEM FOR LEAKS/CLO
     GGING"
5070 PRINT#1,"L{@}@ REPLACE CANISTER"
5080 PRINT#1,"L{@}@ REPLACE BRAKE FLUID
     "
5100 RETURN
```

Program 2: Micro Mechanic—Atari Version

```
80 OPEN #1,4,0,"K:":TRAP 6000:REM TU
   RN ON PRINTER
90 DIM DA$(30),M$(35),PR$(10)
100 GRAPHICS 17:POSITION 3,7:? #6;"M
    icro Mechanic":FOR T=1 TO 1500:N
    EXT T
110 I1=7500:I2=15000:I3=30000:I4=500
    00
120 GRAPHICS 0:? :? "What is the dat
    e ":INPUT DA$
130 ? :? "What model is your car? ":
    INPUT M$
```

Jump on 10 monsters, 64 screens and $10,000 with Pogo Joe.™

A Mutated Wonderwhisk whisks by. The Spinning Top almost topples him!

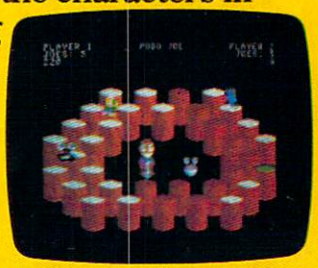
Close. But Pogo Joe bounces back. Bouncing from cylinder to cylinder, screen to screen, Pogo Joe racks up point after point.

You guide him from cylinder to cylinder, changing the color on top of each. Change the top of each cylinder on a screen, then you're on to the next.

The more screens you complete, the nastier the monsters you face, and the faster they attack.

Press the fire button! Jump two cylinders to safety. Hop into a transport tube, and then whoosh! Pogo Joe appears across the screen. Jump on an escaping monster. Blam! It's gone in a flash! Only to reappear out of thin air.

Keep bouncing Joe to original music on realistic 3-dimensional cylinders. All the characters in this rollicking game are also 3-dimensional and fully animated. The graphics almost jump off the screen, leaving the arcades behind.



What's ahead with *Pogo Joe*™ is $10,000. Simply tell us what magic word appears after *Pogo Joe's* tenth screen. If your name is drawn from among the correct answers you'll win $10,000!

No purchase is necessary. You'll find entry forms at any store that sells Screenplay™ games.

But if you don't win you can't lose. *Pogo Joe*™ is so much fun you'll jump for joy no matter what.

screenplay™

Box 3558, Chapel Hill, NC 27514 800-334-5470

Pogo Joe in 48-64K on the Atari and Commodore 64. See your local software dealer.

```
140 ? :? "What is your current milea
    ge? ":INPUT MC
150 PRINT :PRINT
160 FOR J=0 TO 29
170 M1=I1*J:M2=I1*(J+1)+1000
180 IF MC>=M1 AND MC<=M2 THEN 200
190 NEXT J
200 MS=M1+I1:MN=MS
210 FOR J=1 TO 4:MT=I4*J
220 IF (MT+1000)>=MC AND MT<=MS THEN
     MS=MT:SC=4:GOTO 240
230 NEXT J
240 IF MC>MS THEN 260
250 ? "Maintenance due in ";MS-MC;"
    miles":GOTO 270
260 ? MS;" Mile maintenance":? "is "
    ;MC-MS;" miles overdue"
270 ? :? "Press: (P) for checklist"
280 ? "Press: (E) to end program"
290 GET #1,K
300 IF K=ASC("P") THEN 325
310 IF K<>ASC("E") THEN 290
320 END
325 OPEN #2,8,0,"P:"
330 TRAP 6000:GOSUB 1000
340 IF SC=4 THEN GOSUB 5000
350 IF INT(MS/I3)=(MS/I3) THEN SC=3:
    GOTO 390
360 IF INT(MS/I2)=(MS/I2) THEN SC=2:
    GOTO 390
370 IF INT(MS/I1)=(MS/I1) THEN SC=1:
    GOTO 390
380 GOTO 440
390 ON SC GOSUB 4000,3000,2000
400 FOR J=1 TO 4:MT=I4*J
410 IF (MN+I1)>MT AND MN<MT THEN MN=
    MT:GOTO 440
420 NEXT J
430 MN=MN+I1
440 LPRINT :LPRINT "NEXT MAINTENANCE
     DUE AT ";MN;" MILES"
450 PRINT #2
460 CLOSE #2:END
999 REM ** HEADING FOR CHECKLIST **
1000 PRINT #2,"VEHICLE MAINTENANCE C
    HECKLIST FOR ";M$
1010 PRINT #2
1020 PRINT #2,"MILEAGE: ";MC;" ON ";
    DA$
1030 PRINT #2
1040 PRINT #2,"SCHEDULED MAINTENANCE
     FOR ";MS;" MILES"
1050 PRINT #2
1100 RETURN
1999 REM ** INTERVAL 3 MAINTENANCE I
    TEMS **
2000 PRINT #2,"[ ]: CLEAN CARBURETOR
     CHOKE MECHANISM & LINKAGE"
2010 PRINT #2,"[ ]: REPLACE AIR FILT
    ER"
2020 PRINT #2,"[ ]: REPLACE SPARK PL
    UGS"
2030 PRINT #2,"[ ]: REPLACE V-BELT"
2040 PRINT #2,"[ ]: DRAIN FLUSH & RE
    FILL COOLING SYSTEM"
2050 PRINT #2,"[ ]: CHECK BRAKE FLUI
    D LEVEL & CHECK FOR LEAKS"
2060 PRINT #2,"[ ]: CHECK REAR BRAKE
     LINING & WHEEL CYLINDERS"
2070 PRINT #2,"[ ]: CHECK REAR WHEEL
     BEARING FOR GREASE LEAKS"
2999 REM ** INTERVAL 2 MAINTENANCE I
    TEMS **
3000 PRINT #2,"[ ]: REPLACE OIL FILT
    ER"
3010 PRINT #2,"[ ]: CHECK VALVE CLEA
    RANCE"
3020 PRINT #2,"[ ]: CHECK EXHAUST SY
    STEM"
3030 PRINT #2,"[ ]: CHECK CLUTCH PED
    AL FREE PLAY"
3040 PRINT #2,"[ ]: CHECK V-BELT ADJ
    . & CONDITION"
3050 PRINT #2,"[ ]: CHECK LIGHTS AND
     SWITCHES"
3060 PRINT #2,"[ ]: CHECK HEADLIGHT
    AIM"
3070 PRINT #2,"[ ]: CHECK WINDSHIELD
     WIPERS & WASHER"
3080 PRINT #2,"[ ]: CHECK BATTERY"
3090 PRINT #2,"[ ]: CHECK CHARGING &
     STARTING SYSTEM"
3100 PRINT #2,"[ ]: CHECK BRAKE FLUI
    D LEVEL"
3110 PRINT #2,"[ ]: CHECK BRAKE PADS
    "
3120 PRINT #2,"[ ]: CHECK BRAKE ADJ.
     (PEDAL HEIGHT)"
3130 PRINT #2,"[ ]: CHECK BRAKE LINE
    S & HOSES"
3140 PRINT #2,"[ ]: CHECK BRAKE LIGH
    TS"
3150 PRINT #2,"[ ]: CHECK TIRES, WEA
    R, DAMAGE, AIR PRESSURE"
3160 PRINT #2,"[ ]: CHECK BALL JOINT
     & TIE ROD DUST SEALS"
3170 PRINT #2,"[ ]: CHECK STEERING P
    LAY"
3180 PRINT #2,"[ ]: CHECK STEERING G
    EAR BOX BOOTS"
3190 PRINT #2,"[ ]: CHECK WHEEL CAMB
    ER & TOE"
3200 PRINT #2,"[ ]: LUBRICATE DOOR H
    INGES & CHECKS"
3210 PRINT #2,"[ ]: LUBRICATE HOOD,
    TRUNK HINGES & LOCKS"
3220 PRINT #2,"[ ]: LUBRICATE THROTT
    LE LINKAGE, CLUTCH LINKAGE, ETC
    ."
3999 REM ** INTERVAL 1 MAINTENANCE I
    TEMS **
4000 PRINT #2,"[ ]: CHANGE ENGINE OI
    L"
4010 PRINT #2,"[ ]: CHECK COOLING SY
    STEM"
4100 RETURN
4999 REM ** INTERVAL 4 MAINTENANCE I
    TEMS **
5000 PRINT #2,"[ ]: CHECK IGNITION T
    IMING & ADJ. AS REQUIRED"
5010 PRINT #2,"[ ]: REPLACE FUEL FIL
    TER"
5020 PRINT #2,"[ ]: CHECK FUEL SYSTE
    M FOR LEAKS"
5030 PRINT #2,"[ ]: CHECK IGNITION C
    ABLES & REPLACE AS REQUIRED"
5040 PRINT #2,"[ ]: CHECK FUEL, WATE
    R & FUEL VAPOR HOSES & REPLACE
    AS REQUIRED"
5050 PRINT #2,"[ ]: CHECK CRANKCASE
    EMISSION CONTROL SYSTEM & CLEAN
     AS REQUIRED"
5060 PRINT #2,"[ ]: CHECK EVAPORATIV
    E EMISSION CONTROL FOR LEAKS/CL
    OGGING"
5070 PRINT #2,"[ ]: REPLACE CANISTER"
5080 PRINT #2,"[ ]: REPLACE BRAKE FL
    UID"
```

GO WITH THE WINNER

If you wanted to bet on the horses, you'd get advice from somebody who'd been a success at betting on the horses.

So it's only reasonable to demand that the blackjack program you buy be one with a PROVEN system from a PROVEN winner at blackjack. Not from some anonymous programmer who can't change the filter in his coffee-maker. Not from some Sunday afternoon sports analyst, but from a man whose "Winningest System" earned him appearances on CBS Television's *60 Minutes* — and a penthouse in Las Vegas. Ken Uston.

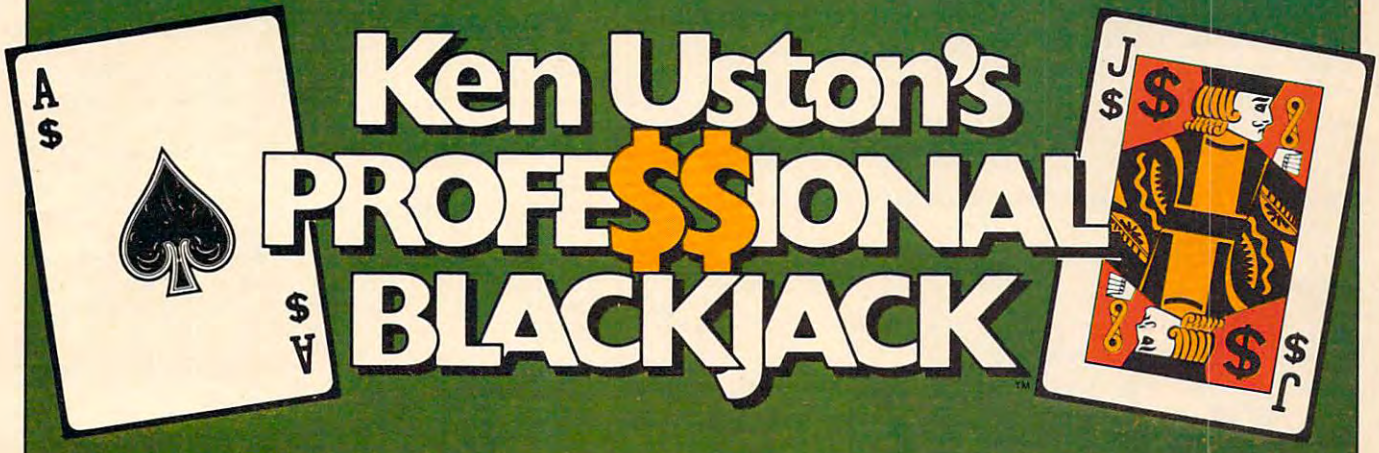
Now, Ken Uston and Intelligent Statements can help make you a winner three ways — three ways that add up to make *Ken Uston's Professional Blackjack* truly the winningest blackjack program ever!

WINNING FEATURE #1
An Unbelievable Program

Ken Uston's Professional Blackjack is a real winning program, with features unavailable on any other program at any other price. It's the most complete and realistic blackjack game money can buy. You'll meet the same playing opportunities that you'd face at a real blackjack table — at your choice of over 70 Nevada and Atlantic City casinos, each with its own set of rules and variations. Or you can create your own casino, manipulating sixteen different game variables to produce an unbelievable 39,813,120 different playing situations. Select the number of decks in the shoe, vary the dealing speed, and much, much more. And all your data is accurately displayed, so you can play the strategy you like and get the feedback you need to win.

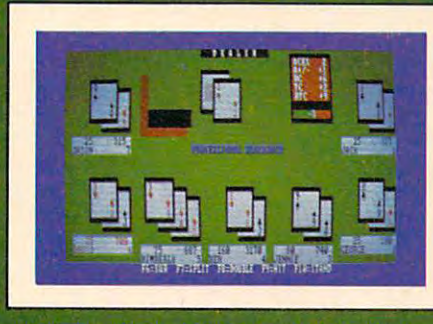
A Teaching System for Winners

Ken Uston's Professional Blackjack is the most thorough and authoritative teaching system you can buy. Now you can learn all of Ken Uston's computer-optimized card-counting strategies, from basic to advanced levels. Menu-driven interactive drills — augmented by superb documentation — lead you through each skill level. At any point you can choose to see accurate running counts, continuous statistical evaluations, discard deck totals and instructional prompts, complete with sound effects. So you develop and refine the skills you need to WIN BIG.



WINNING FEATURE #2
An Unbelievable Free Offer

In the package containing this winning program, we'll include, absolutely free, a coupon that entitles you to a free copy of *Million Dollar Blackjack*, Ken Uston's authoritative text on the game of blackjack — an $18.95 value! This book fully describes the blackjack system that won Ken Uston a reputation as the world's foremost blackjack player and rocketed him to nationwide fame in his apperances on *60 Minutes*. This is the system that made Uston such a threat to casinos that he's been barred from their playing tables — and it's implemented fully in this program and described in-depth in this book. If you want to investigate the reasoning behind the winningest blackjack system ever designed, this book is a must. If you want to LEARN the system, quickly and painlessly, this program is a must. We're offering you both — at a winning price.



IBM PC* REQUIREMENTS: 48K RAM, disk drive, PC-DOS*, 80-character display. Color and monochrome versions supplied with each package.
APPLE II** REQUIREMENTS: DOS 3.3, 48K RAM, disk drive, 40-character display.
OSBORNE 1™ REQUIREMENTS: Standard Osborne 1 package.
ATARI** 400/800/1200 REQUIREMENTS: 48K RAM and one disk drive.
*Display shows actual photograph of IBM PC version. Apple and Atari color graphics and Osborne monochrome graphics are similar. Versions for TRS-80** and other brands will be available shortly.*

WINNING FEATURE #3
An Unbelievably Low Price

The price for the winningest blackjack system ever is a winner, too. Including the software, the coupon and thorough documentation, *Ken Uston's Professional Blackjack* is an amazingly low $69.95. There are other programs that cost less and offer less. There are other programs that cost more and still offer less. This program is the winner, hands down.

Don't bet your money on losers. Play the system that made Ken Uston the world's winningest blackjack player. Only from Intelligent Statements. Try your dealer — or, if he doesn't have it, call 1-800-334-5470 today.

Be a winner with Intelligent Statements software.

screenplay
Division of Intelligent Statements

GROWN-UP GAMEWARE

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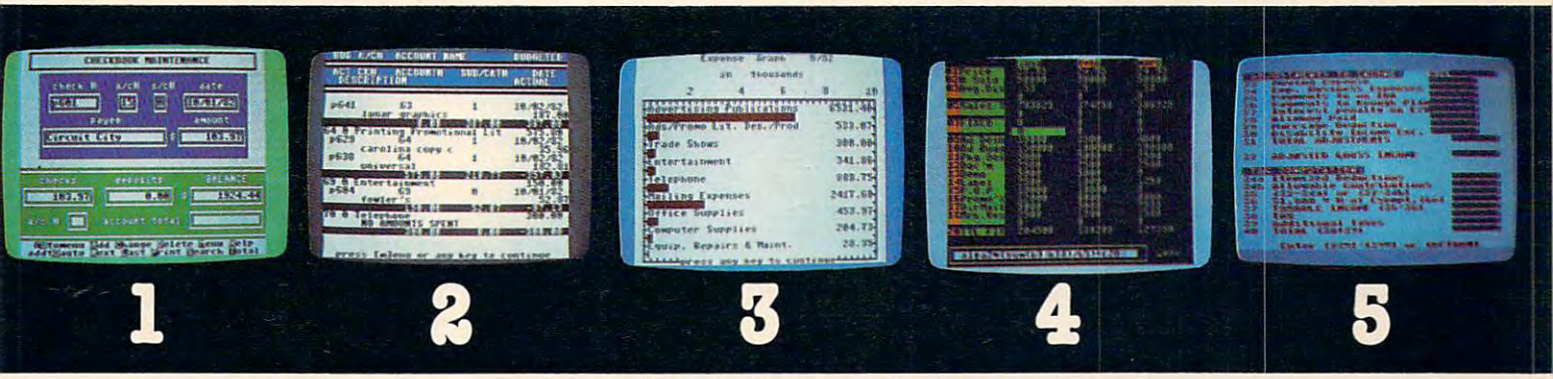
```
5100 RETURN
6000 PRINT :PRINT "Please turn on yo
     ur printer, and then hit RETURN
     ":INPUT PR$
6010 GOTO 330
```

Program 3:
Micro Mechanic—TI-99/4A Version

```
100 I1=7500
102 I2=15000
104 I3=30000
110 I4=50000
115 CALL CLEAR
120 PRINT TAB(6);"MICRO MECHANIC"
125 PRINT
130 PRINT "DATE (eg., 10/25/1983)"
135 INPUT DATE$
140 PRINT
142 INPUT "MODEL OF CAR ?":MAKE$
144 PRINT
146 INPUT "CURRENT MILEAGE ?":MC
150 PRINT
160 FOR J=0 TO 29
170 M1=I1*J
175 M2=I1*(J+1)+1000
180 IF (MC>=M1)*(MC<=M2)THEN 196
190 NEXT J
196 MS=M1+I1
200 MN=MS
210 FOR J=1 TO 4
214 MT=I4*J
218 IF ((MT+1000)>=MC)*(MT<=MS)THEN
     223
221 NEXT J
222 GOTO 240
223 MS=MT
230 SC=4
240 IF MC>MS THEN 260
250 PRINT "MAINTENANCE DUE IN ";MS-
    MC;" MILES"
252 PRINT
255 GOTO 270
260 PRINT MS;" MILE MAINTENANCE IS"
265 PRINT MC-MS;" MILES OVERDUE"
268 PRINT
270 PRINT "PRESS (P) FOR CHECKLIST"
280 PRINT "PRINT (E) TO END"
290 CALL KEY(0,K,S)
300 IF K=80 THEN 330
310 IF K<>69 THEN 290
320 STOP
330 GOSUB 1000
340 IF SC=4 THEN 5000
350 IF INT(MS/I3)<>(MS/I3)THEN 360
353 SC=3
356 GOTO 390
360 IF INT(MS/I2)<>(MS/I2)THEN 370
363 SC=2
366 GOTO 390
370 IF INT(MS/I1)<>(MS/I1)THEN 380
373 SC=1
376 GOTO 390
380 GOTO 440
390 ON SC GOSUB 4000,3000,2000
400 FOR J=1 TO 4
404 MT=I4*J
410 IF ((MN+I1)>MT)*(MN<MT)THEN 415
412 NEXT J
413 GOTO 430
415 MN=MT
420 GOTO 440
430 MN=MN+I1
440 PRINT #1
450 PRINT #1:"NEXT MAINTENANCE DUE
    AT ";MN;" MILES"
460 CLOSE #1
465 STOP
999 REM  ** HEADING FOR CHECKLIST
1000 OPEN #1:"RS232"
1005 PRINT #1:"VEHICLE CHECKLIST FO
     R ";MAKE$
1010 PRINT #1
1020 PRINT #1:"MILEAGE: ";MC;" ON "
     ;DATE$
1030 PRINT #1
1040 PRINT #1:"SCHEDULED MAINTENANC
     E FOR ";MS;" MILES"
1050 PRINT #1
1100 RETURN
1999 REM  ** INTERVAL 3 MAINTENANCE
      ITEMS **
2000 PRINT #1:"( ): CLEAN CARBURETO
     R CHOKE MECHANISM & LINKAGE"
2010 PRINT #1:"( ): REPLACE AIR FIL
     TER"
2020 PRINT #1:"( ): REPLACE SPARK P
     LUGS"
2030 PRINT #1:"( ): REPLACE V-BELT"
2040 PRINT #1:"( ): DRAIN FLUSH & R
     EFILL COOLING SYSTEM"
2050 PRINT #1:"( ): CHECK BRAKE FLU
     ID LEVEL & CHECK FOR LEAKS"
2060 PRINT #1:"( ): CHECK REAR BRAK
     E LINING & WHEEL CYLINDERS"
2070 PRINT #1:"( ): CHECK REAR WHEE
     L BEARING FOR GREASE LEAKS"
2999 REM  ** INTERVAL 2 MAINTENANCE
      ITEMS
3000 PRINT #1:"( ): REPLACE OIL FIL
     TER"
3010 PRINT #1:"( ): CHECK VALVE CLE
     ARANCE"
3020 PRINT #1:"( ): CHECK EXHAUST S
     YSTEM"
3030 PRINT #1:"( ): CHECK CLUTCH PE
     DAL FREE PLAY"
3040 PRINT #1:"( ): CHECK V-BELT AD
     J & CONDITION"
3050 PRINT #1:"( ): CHECK LIGHTS AN
     D SWITCHES"
3060 PRINT #1:"( ): CHECK HEADLIGHT
      AIM"
3070 PRINT #1:"( ): CHECK WINDSHIEL
     D WIPERS & WASHER"
3080 PRINT #1:"( ): CHECK BATTERY"
3090 PRINT #1:"( ): CHECK CHARGING
     & STARTING SYSTEM"
3100 PRINT #1:"( ): CHECK BRAKE FLU
     ID LEVEL"
3110 PRINT #1:"( ): CHECK BRAKE PAD
     S"
3120 PRINT #1:"( ): CHECK BRAKE ADJ
      (PEDAL HEIGHT)"
3130 PRINT #1:"( ): CHECK BRAKE LIN
     ES & HOSES"
3140 PRINT #1:"( ): CHECK BRAKE LIG
     HTS"
3150 PRINT #1:"( ): CHECK TIRES, WE
     AR, DAMAGE, AIR PRESSURE"
3160 PRINT #1:"( ): CHECK BALL JOIN
     T & TIE ROD DUST SEALS"
```

Five Easy Ways To Clean Up Your Finances.



actual screen display *indicates function being shown

Chart of Accounts
*Checkbook Maintenance
Check Search
Prints Checks

*Detail Budget Analysis
Summary Budget Analysis
Income/Expense Statements
Net Worth Statement

Appointments Calendar
Payments Calendar
*Color Chart Package
Mailing List

*Spreadsheet
Compatible with Finance 1, 2 and 5

*Income Tax
Prints forms
Most schedules
Uses Finance 1, 2 and 4

the Complete Personal Accountant™

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Finance 3	29.95	24.95
Finance 4	29.95	24.95
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*Varies according to computer.

programmer's institute a division of futurehouse

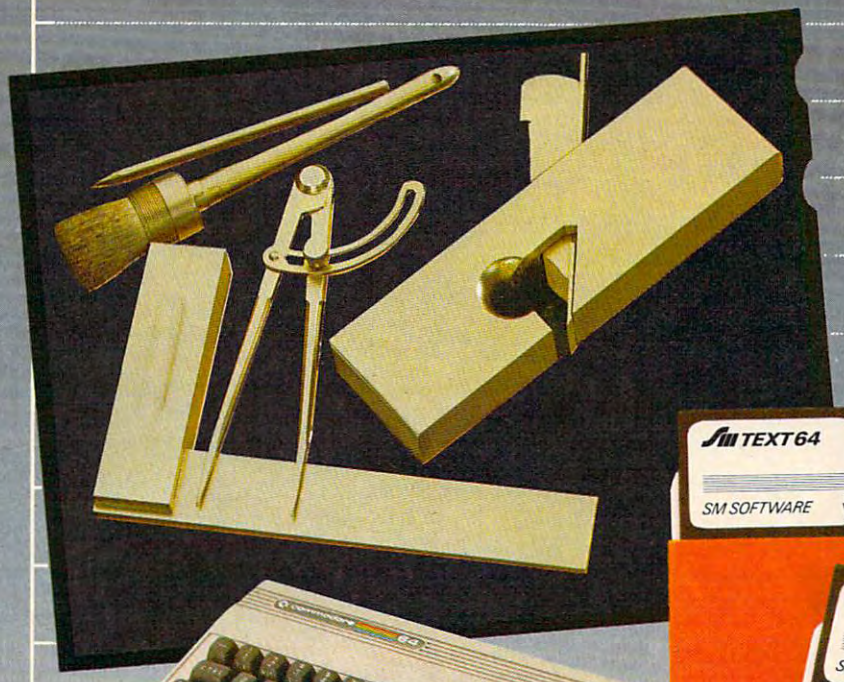
p.o. box 3470, department c, chapel hill, north carolina 27514

```
3170 PRINT #1:"( ): CHECK STEERING
     PLAY"
3180 PRINT #1:"( ): CHECK STEERING
     GEAR BOX BOOTS"
3190 PRINT #1:"( ): CHECK WHEEL CAM
     BER & TOE"
3200 PRINT #1:"( ): LUBRICATE DOOR
     HINGES & CHECKS"
3210 PRINT #1:"( ): LUBRICATE HOOD,
      TRUNK HINGES & LOCKS"
3220 PRINT #1:"( ): LUBRICATE THROT
     TLE LINKAGE, CLUTCH LINKAGE, E
     TC."
3999 REM  ** INTERVAL 1 MAINTENANCE
      ITEMS
4000 PRINT #1:"( ): CHANGE ENGINE O
     IL"
4010 PRINT #1:"( ): CHECK COOLING S
     YSTEM"
4020 RETURN
4999 REM  ** INTERVAL 4 MAINTENANCE
      ITEMS
5000 PRINT #1:"( ): CHECK IGNITION
     TIMING & ADJ AS REQUIRED"
5010 PRINT #1:"( ): REPLACE FUEL FI
     LTER"
5020 PRINT #1:"( ): CHECK FUEL SYST
     EM FOR LEAKS"
5030 PRINT #1:"( ): CHECK IGNITION
     CABLES & REPLACE AS REQUIRED"
5040 PRINT #1:"( ): CHECK FUEL, WAT
     ER & FUEL VAPOR HOSES & REPLAC
     E AS REQUIRED"
5050 PRINT #1:"( ): CHECK CRANKCASE
      EMISSION CONTROL SYSTEM & CLE
     AN AS REQUIRED"
5060 PRINT #1:"( ): CHECK EVAPORATI
     VE EMISSION CONTROL SYSTEM FOR
      LEAKS/CLOGGING"
5070 PRINT #1:"( ): REPLACE CANISTE
     R"
5080 PRINT #1:"( ): REPLACE BRAKE F
     LUID"
5100 GOTO 350
```

Program 4: Micro Mechanic—Apple Version

```
110 I1 = 7500:I2 = 15000:I3 = 30000:I4 =
    50000
120  HOME : INVERSE : PRINT : PRINT : HTAB
    14: PRINT "MICRO MECHANIC ": PRINT
    : NORMAL
130  INPUT "ENTER DATE (IE., 10/26/83)
    ? ";DA$: PRINT : PRINT : INPUT "MO
    DEL OF CAR ? ";M$
140  PRINT : PRINT : INPUT "CURRENT MIL
    EAGE ? ";MC
150  PRINT
160  FOR J = 0 TO 29
170 M1 = I1 * J:M2 = I1 * (J + 1) + 100
    0
180  IF MC >  = M1 AND MC <  = M2 THEN
    200
190  NEXT
200 MS = M1 + I1:MN = MS
210  FOR J = 1 TO 4:MT = I4 * J
220  IF (MT + 1000) >  = MC AND MT <  =
    MS THEN MS = MT:SC = 4: GOTO 240
230  NEXT
240  IF MC > MS THEN 260
250  PRINT "MAINTENANCE DUE IN ";MS - M
    C;" MILES": GOTO 270
260  PRINT "YOUR ";MS;" MILE MAINTENANC
    E ": PRINT : PRINT "IS ";MC - MS;"
     MILES OVERDUE"
270  PRINT : PRINT "PRESS:": PRINT : PRINT
    "    P TO PRINT CHECKLIST"
280  PRINT "    E TO END PROGRAM"
290  GET K$: IF K$ = "" THEN 290
300  IF K$ = "P" THEN 330
310  IF K$ <  > "E" THEN 290
320  END
330  PR# 1: GOSUB 1000
340  IF SC = 4 THEN  GOSUB 5000
350  IF  INT (MS / I3) = (MS / I3) THEN
    SC = 3: GOTO 390
360  IF  INT (MS / I2) = (MS / I2) THEN
    SC = 2: GOTO 390
370  IF  INT (MS / I1) = (MS / I1) THEN
    SC = 1: GOTO 390
380  GOTO 440
390  ON SC GOSUB 4000,3000,2000
400  FOR J = 1 TO 4:MT = I4 * J
410  IF MT < (MN + I1) AND MT > MN THEN
    MN = MT: GOTO 440
420  NEXT
430 MN = MN + I1
440  PRINT : PRINT "NEXT MAINTENENCE DU
    E AT ";MN;" MILES"
450  PRINT
460  PR# 0: END
999  REM ** HEADING FOR CHECKLIST
1000  PRINT "VEHICLE MAINTENANCE CHECKL
    IST FOR ";M$
1010  PRINT
1020  PRINT "MILEAGE:";MC,"DATE ";DA$
1030  PRINT
1040  PRINT "SCHEDULED MAINTENANCE FOR
    ";MS;" MILES"
1050  PRINT
1060  RETURN
1999  REM   ** INTERVAL 3 MAINTENANCE I
    TEMS
2000  PRINT "( ): CLEAN CARBURETOR CHOK
    E MECHANISM & LINKAGE"
2010  PRINT "( ): REPLACE AIR FILTER"
2020  PRINT "( ): REPLACE SPARK PLUGS"
2030  PRINT "( ): REPLACE V-BELT"
2040  PRINT "( ): DRAIN FLUSH AND REFIL
    L COOLING SYSTEM"
2050  PRINT "( ): CHECK BRAKE FLUID LEV
    EL & CHECK FOR LEAKS"
2060  PRINT "( ): CHECK REAR BRAKE LINI
    NGS & WHEEL CYLINDERS"
2070  PRINT "( ): CHECK REAR WHEEL BEAR
    INGS FOR GREASE LEAKS"
2999  REM ** INTERVAL 2 MAINTENANCE ITE
    MS
3000  PRINT "( ): REPLACE OIL FILTER"
3010  PRINT "( ): CHECK VALVE CLEARANCE
    "
3020  PRINT "( ): CHECK EXHAUST SYSTEM"
3030  PRINT "( ): CHECK CLUTCH PEDAL FR
    EE PLAY"
3040  PRINT "( ): CHECK V-BELT ADJ & CO
    NDITION"
3050  PRINT "( ): CHECK LIGHTS AND SWIT
    CHES"
3060  PRINT "( ): CHECK HEADLIGHT AIM"
3070  PRINT "( ): CHECK WINDSHIELD WIPE
    RS & WASHERS"
3080  PRINT "( ): CHECK BATTERY"
3090  PRINT "( ): CHECK CHARGING & STAR
    TING SYSTEM"
```

STRUGGLED BY BAD SOFTWARE?



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```
3100  PRINT "( ): CHECK BRAKE FLUID LEV
      EL"
3110  PRINT "( ): CHECK BRAKE PADS"
3120  PRINT "( ): CHECK BRAKE ADJ (PEDA
      L HEIGHT)"
3130  PRINT "( ): CHECK BRAKE LINES & H
      OSES"
3140  PRINT "( ): CHECK BRAKE LIGHTS"
3150  PRINT "( ): CHECK TIRES, WEAR, DA
      MAGE, AIR PRESSURE"
3160  PRINT "( ): CHECK BALL JOINT & TI
      E ROD DUST SEALS"
3170  PRINT "( ): CHECK STEERING PLAY"
3180  PRINT "( ): CHECK STEERING GEAR B
      OX BOOTS"
3190  PRINT "( ): CHECK WHEEL CAMBER &
      TOE"
3200  PRINT "( ): LUBRICATE DOOR HINGES
       & CHECKS"
3210  PRINT "( ): LUBRICATE HOOD, TRUNK
       HINGES & LOCKS"
3220  PRINT "( ): LUBRICATE THROTTLE LI
      NKAGE, CLUTCH LINKAGE, ETC."
3999  REM  INTERVAL 1 MAINTENANCE ITEMS

4000  PRINT "( ): CHANGE ENGINE OIL"
4010  PRINT "( ): CHECK COOLING SYSTEM"

4020  RETURN
4999  REM ** INTERVAL 4 MAINTENANCE ITE
      MS
5000  PRINT "( ): CHECK IGNITION TIMING
       & ADJ AS REQUIRED"
5010  PRINT "( ): REPLACE FUEL FILTER"
5020  PRINT "( ): CHECK FUEL SYSTEM FOR
       LEAKS"
5030  PRINT "( ): CHECK IGNITION CABLES
       & REPLACE AS REQUIRED"
5040  PRINT "( ): CHECK FUEL, WATER & F
      UEL VAPOR HOSES & REPLACE AS REQUI
      RED"
5050  PRINT "( ): CHECK CRANKCASE EMISS
      ION CONTROL SYSTEM & CLEAN AS REQU
      IRED"
5060  PRINT "( ): CHECK EVAPORATIVE EMI
      SSION CONTROL SYSTEM FOR LEAKS/CLO
      GGING"
5070  PRINT "( ): REPLACE CANISTER"
5080  PRINT "( ): REPLACE BRAKE FLUID"
5090  RETURN
```

Program 5:

Micro Mechanic—TRS-80 Color Computer Version

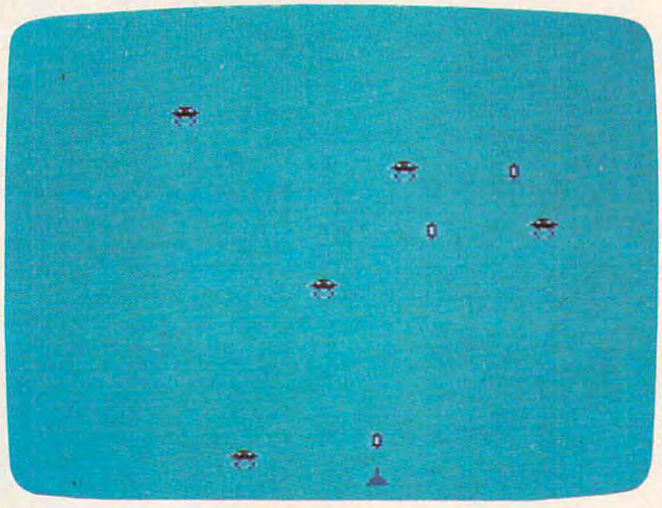
```
100 CLS
110 I1=7500:I2=15000:I3=30000:I4=50
    000
120 PRINT:PRINT:PRINT"MICRO MECHANI
    C":PRINT
130 PRINT"WHAT IS THE DATE (IE., 10
    /25/83)";:INPUT DA$:PRINT:INPUT
    "MODEL OF CAR ";M$
140 PRINT:INPUT"CURRENT MILEAGE ";M
    C
150 PRINT:PRINT
160 FOR J=0TO29
170 M1=I1*J:M2=I1*(J+1)+1000
180 IF MC>=M1 AND MC<=M2 THEN 200
190 NEXTJ
200 MS=M1+I1:MN=MS
210 FOR J=1TO4:MT=I4*J
220 IF (MT+1000)>=MC AND MT<=MS THE
    N MS=MT :SC=4:GOTO240
230 NEXTJ
240 IF MS<MC THEN 260
250 PRINT"MAINTENANCE DUE IN ";MS-M
    C;" MILES":GOTO270
260 PRINT MS;"MILE MAINTENANCE":PRI
    NT" IS ";MC-MS;" MILES OVERDUE"
270 PRINT:PRINT"PRESS (P) FOR PRINT
     OUT"
280 PRINT:PRINT"PRESS (E) TO END"
290 K$=INKEY$:IF K$=""THEN290
300 IF K$="P" THEN 330
310 IF K$<>"E" THEN 290
320 END
330 GOSUB 1000
340 IF SC=4 THEN GOSUB 5000
350 IF INT(MS/I3)=(MS/I3)THEN SC=3:
    GOTO390
360 IF INT(MS/I2)=(MS/I2) THEN SC=2
    :GOTO390
370 IF INT(MS/I1)=(MS/I1)THEN SC=1:
    GOTO390
380 GOTO440
390 ON SC GOSUB 4000,3000,2000
400 FOR J=1TO4:MT=I4*J
410 IF (MN+I1)>MT AND MN<MT THEN MN
    =MT:GOTO 440
420 NEXT J
430 MN=MN+I1
440 PRINT #-2:PRINT#-2,"NEXT MAINTE
    NANCE DUE AT ";MN;" MILES"
450 PRINT #-2,""
455 PRINT #-2,"63999 END"
460 END
999 REM ** HEADING FOR CHECKLIST
1000 PRINT#-2,"VEHICLE MAINTENANCE
     CHECKLIST FOR ";M$
1010 PRINT#-2
1020 PRINT#-2,"MILEAGE: ";MC;" ON "
     ;DA$
1030 PRINT#-2
1040 PRINT#-2,"SCHEDULED MAINTENANC
     E FOR ";MS;" MILES"
1050 PRINT#-2
1100 RETURN
1999 REM ** INTERVAL 3 MAINTENANCE
     ITEMS
2000 PRINT #-2,"( ): CLEAN CARBURET
     OR CHOKE MECHANISM & LINKAGE"
2010 PRINT#-2,"( ): REPLACE AIR FIL
     TER"
2020 PRINT#-2,"( ): REPLACE SPARK P
     LUGS"
2030 PRINT #-2,"( ): REPLACE V-BELT"
2040 PRINT #-2,"( ): DRAIN FLUSH &
     REFILL COOLING SYSTEM"
2050 PRINT #-2,"( ): CHECK BRAKE FL
     UID LEVEL & CHECK FOR LEAKS"
2060 PRINT #-2,"( ): CHECK REAR BRA
     KE LINING & WHEEL CYLINDERS"
2070 PRINT #-2,"( ): CHECK REAR WHE
     EL BEARING FOR GREASE LEAKS"
2999 REM ** INTERVAL 2 MAINTENANCE
     ITEMS
3000 PRINT #-2,"( ): REPLACE OIL FI
     LTER"
3010 PRINT #-2,"( ): CHECK VALVE CL
     EARANCE"
3020 PRINT #-2,"( ): CHECK EXHAUST
     SYSTEM"
3030 PRINT #-2,"( ): CHECK CLUTCH P
```

```
      EDAL FREE PLAY"
3040  PRINT #-2,"( ): CHECK V-BELT A
      DJ & CONDITION"
3050  PRINT #-2."( ): CHECK LIGHTS A
      ND SWITCHES"
3060  PRINT #-2."( ): CHECK HEADLIGH
      T AIM"
3070  PRINT #-2,"( ): CHECK WINDSHIE
      LD WIPERS & WASHER"
3080  PRINT#-2,"( ): CHECK BATTERY"
3090  PRINT #-2,"( ): CHECK CHARGING
       & STARTING SYSTEM"
3100  PRINT #-2,"( ): CHECK BRAKE FL
      UID LEVEL"
3110  PRINT #-2,"( ): CHECK BRAKE PA
      DS"
3120  PRINT #-2,"( ): CHECK BRAKE AD
      J (PEDAL HEIGHT)"
3130  PRINT #-2,"( ): CHECK BRAKE LI
      NES & HOSES"
3140  PRINT #-2,"( ): CHECK BRAKE LI
      GHTS"
3150  PRINT #-2,"( ): CHECK TIRES, W
      EAR, DAMAGE, AIR PRESSURE"
3160  PRINT #-2,"( ): CHECK BALL JOI
      NT & TIE ROD DUST SEALS"
3170  PRINT #-2,"( ): CHECK STEERING
       PLAY"
3180  PRINT #-2,"( ): CHECK STEERING
       GEAR BOX BOOTS"
3190  PRINT #-2,"( ): CHECK WHEEL CA
      MBER & TOE"
3200  PRINT #-2,"( ): LUBRICATE DOOR
       HINGES & CHECKS"
3210  PRINT #-2,"( ): LUBRICATE HOOD
      , TRUNK HINGES & LOCKS"
3220  PRINT #-2,"( ): LUBRICATE THRO
      TTLE LINKAGE, CLUTCH LINKAGE,
      ETC."
3999  REM ** INTERVAL 1 MAINTENANCE
      ITEMS
4000  PRINT #-2,"( ): CHANGE ENGINE
      OIL"
4010  PRINT #-2,"( ): CHECK COOLING
      SYSTEM"
4100  RETURN
4999  REM ** INTERVAL 4 MAINTENANCE
      ITEMS
5000  PRINT #-2,"( ): CHECK IGNITION
       TIMING & ADJ AS REQUIRED"
5010  PRINT #-2,"( ): REPLACE FUEL F
      ILTER"
5020  PRINT #-2,"( ): CHECK FUEL SYS
      TEM FOR LEAKS"
5030  PRINT #-2,"( ): CHECK IGNITION
       CABLES & REPLACE AS REQUIRED"
5040  PRINT #-2."( ): CHECK FUEL, WA
      TER & FUEL VAPOR HOSES & REPLA
      CE AS REQUIRED"
5050  PRINT #-2,"( ): CHECK CRANKCAS
      E EMISSION CONTROL SYSTEM & CL
      EAN AS REQUIRED"
5060  PRINT #-2,"( ): CHECK EVAPORAT
      IVE EMISSION CONTROL SYSTEM FO
      R LEAKS/CLOGGING"
5070  PRINT #-2,"( ): REPLACE CANIST
      ER"
5080  PRINT #-2,"( ): REPLACE BRAKE
      FLUID"
5100  RETURN                    ©
```

Demons Of Osiris

Steve Haynal

You must defend your fleet of base ships against wave after wave of lightning-fast Osirian attackers as they weave and dodge through your covering fire. The Osirians do not descend blindly; they counter your evasive moves and seek you out. Theirs is a maniacal mission. Written for the unexpanded VIC, versions are included for 64 and Atari.



The player defends against descending demons in the VIC version of "Demons of Osiris."

"Demons of Osiris" is a fast-paced, arcade-style machine language game. The object is to shoot the falling Osirians, but at the same time they'll use their intelligence to try to destroy you. You can choose from 240 speed levels, with level 1 being the fastest. You may also choose between 1–240 base ships. Be prepared to battle as many as eight Osirians at a time.

Your base ship is located at the bottom of the screen. You control its functions as follows: Press T to move left, U to move right, and SHIFT to fire. Pressing the SHIFT-LOCK key will give you rapid fire. When the screen flashes red it means you have lost a base ship.

Simple, But Effective

The Osirians have a simple but effective strategy. They have two moves, a defensive and an offensive move. On a defensive move, the Osirians will dodge your oncoming bullet, moving either right or left. On the offensive, they will move to one side of your line of fire. They do not come down directly above you because it would increase their chances of being hit. The Osirians can destroy your base ship by being in the space directly above your base ship, directly above you and to the right, and directly above you and to the left. On some occasions they will activate a special defensive mechanism which triggers evasive action around your missiles.

The strategy is to keep moving and fire rapidly. At slow speeds (25–240), try to aim as much as possible. At fast speeds (1–24), things move so quickly it's best just to try to dodge the Osirians.

You'll Need To Abbreviate

The machine language portion of Demons of Osiris takes 696 bytes and the BASIC part, which runs with the machine language portion, is only three lines long. The machine language portion is in the form of DATA statements which are POKEd into memory. The whole program, including the DATA statements, takes all of an unexpanded VIC-20's memory.

Because of the VIC's limited memory, most of the program lines are quite long. You may need to abbreviate some BASIC keywords (see Appendix D of *Personal Computing on the VIC-20*, which came with your computer). In particular, you should use the abbreviation for DATA, D and SHIFT-A, in lines 35–190.

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SERPENTINE*
For the Commodore VIC-20.

Three huge and evil red snakes are slithering through the corridors of a burnt-out city, closing in on your good blue serpent from all sides. Move fast, watch your tail, and try to survive long enough to let your eggs hatch into reinforcements. Swallow the magical frogs or your enemy's eggs and you get the strength to go on! Complex strategy-action and increasing levels of difficulty.

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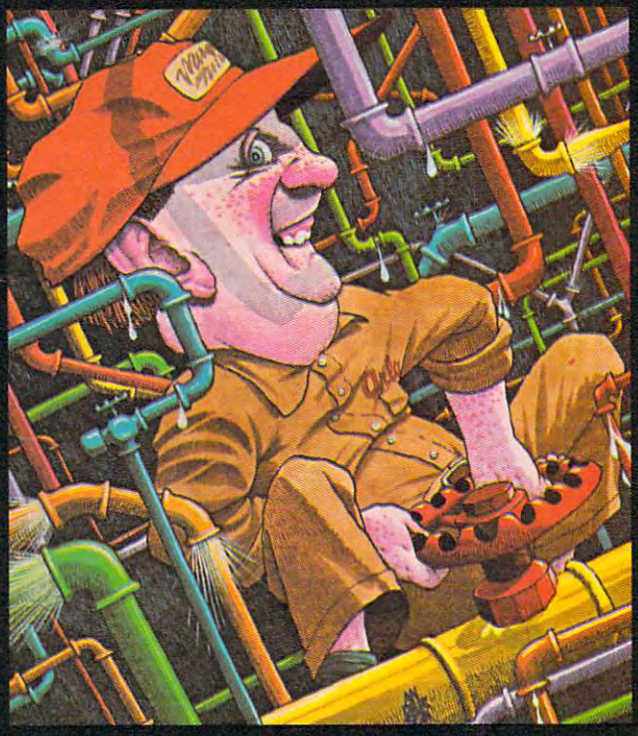

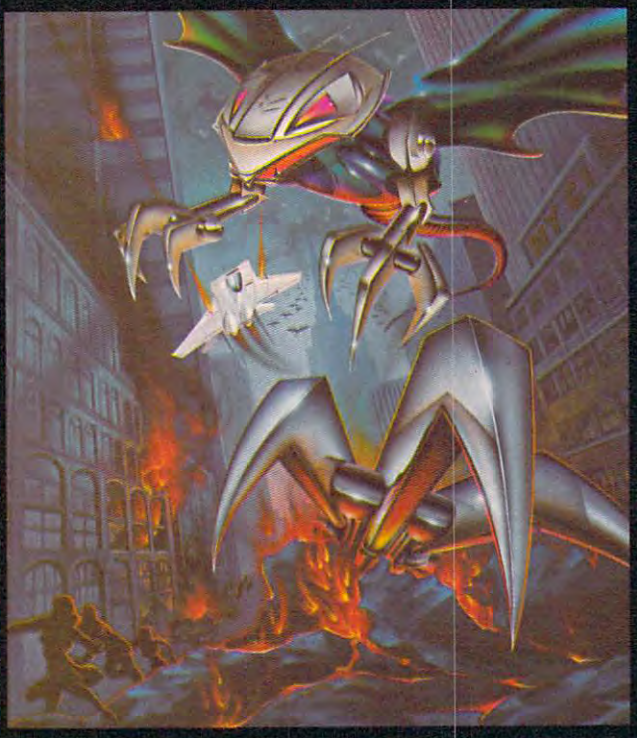

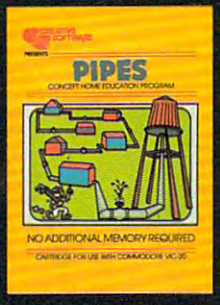

PIPES*
For the VIC-20 and Commodore 64.

Arlo is a hardworking plumber, but a touch absent-minded. Help him construct a water-supply system for a whole neighborhood. Choose the right pipes from the factory, plan the most economical layout, and just hope Arlo has remembered to open and close the right valves! A marvelously entertaining and challenging exercise in planning, economics and spatial relationships for all ages.

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S O F T W A R E

After typing the program, be sure to SAVE it before you RUN it. One mistake in the DATA statements might cause a crash, and you would have to type the program again.

When you run it, there will be a short wait while the computer reads the DATA. It will then ask you for your speed and the number of base ships you want. Both of these can be from 1 to 240. An average game would use 60 for speed and 5 for ships. There will again be a short wait, to allow you time to position your fingers on the T and U keys. Press SHIFT-LOCK at this time if you want rapid fire. Otherwise, use SHIFT for normal fire. When the game is finished, it will display your score and will repeat the cycle at the point where it asks for the speed.

If you don't want to type this program into your computer, I will make you a copy of it on tape (VIC version only). Send $3 and a self-addressed stamped mailer to:

Steve Haynal
1325 Olive Ave.
Redlands, CA 92373

Program 1: Demons Of Osiris For VIC

```
10 POKE52,27:POKE56,27:POKE51,71:POKE55,7
   1:PRINT"{CLR}":FORA=6984TO7679:READB:P
   OKEA,B:NEXT
15 POKE649,10:INPUT"SPEED";A:INPUT"SHIPS"
   ;B:IFA>240ORB>240ORA<1ORB<1THEN15
20 POKE7074,A:POKE7039,B:POKE649,0:FORB=0
   TO2000:NEXT
25 SYS6984:POKE36869,240:PRINT"{CLR}SCORE
   :"PEEK(248)+PEEK(249)*256:GOTO15
35 DATA162,10,169,0,149,247,202,208,251,1
   68,169,59,157,0,30,157,0,31,232,208,24
   7,141,15
40 DATA144,169,255,141,5,144,169,15,141,1
   4,144,138,157,0,150,157,228,150,232,20
   8,247
45 DATA169,6,162,22,157,227,151,202,208,2
   50,169,5,133,253,200,208,253,232,208,2
   53,169
50 DATA238,133,251,169,31,133,252,169,63,
   145,251,165,197,201,50,240,31,201,51,2
   40,13
55 DATA140,13,144,162,63,200,208,253,202,
   208,250,240,41,165,251,201,249,240,237
   ,32,202
60 DATA27,230,251,76,196,27,165,251,201,2
   28,240,223,32,202,27,198,251,169,63,14
   5,251
65 DATA208,215,169,129,141,13,144,169,59,
   145,251,96,169,1,44,141,2,240,44,162,6
   6,189
70 DATA161,31,201,61,240,35,202,208,246,1
   65,251,56,233,22,133,251,169,61,145,25
   1,165
75 DATA251,24,105,22,133,251,140,13,144,1
   69,160,141,11,144,141,10,144,232,208,2
   53,169
80 DATA30,133,255,169,21,133,254,162,21,1
   60,22,177,254,201,61,208,29,32,246,28,
   177,254
85 DATA201,59,240,9,32,14,29,32,232,28,76
   ,50,28,169,61,145,254,32,232,28,169,59
   ,145
90 DATA254,136,208,218,32,232,28,202,208,
   210,162,22,189,255,29,201,61,208,5,169
   ,59,157
95 DATA255,29,202,208,241,140,10,144,140,
   11,144,162,66,189,255,29,201,62,240,21
   ,202,208
100 DATA246,32,86,29,165,141,162,0,232,56
    ,233,12,176,250,169,62,157,255,29
105 DATA169,31,133,255,169,227,133,254,16
    0,22,177,254,201,63,240,3,136,208,247
110 DATA132,250,32,246,28,177,254,201,62,
    208,6,169,59,145,254,16,27,136,177,25
    4,201,62
115 DATA208,7,169,59,145,254,200,16,13,20
    0,200,177,254,201,62,208,24,169,59,14
    5,254,136
120 DATA32,232,28,32,4,29,169,59,160,22,1
    53,227,31,136,208,250,76,130,27,160,2
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    ,145,254,165,255,56,233,120,133,255,1
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    1,15,144,104,104,96,169,240,141,12,14
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190 DATA40,40,40,56,16,60,90,255,126,36,6
    6,66,36,16,16,16,16,56,124,124,254
```

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Programming Notes, 64 Version

Gregg Peele, Assistant Programming Supervisor

The 64 version of "Demons of Osiris" (Program 2) uses seven sprites for the demons which swoop down relentlessly toward your base. There are six levels of difficulty in this version, and you may choose the number of base ships you want—up to 99 ships per play.

You may use either a joystick (plugged into port 2) or the keyboard (press T to move left and U to move right) to move your base and evade the descending demons. Either press the joystick fire button (trigger) or one of the SHIFT keys to shoot at the demons. SHIFT LOCK can be used for continuous fire. Press the f7 function key to freeze the program, then press any other key to continue play.

Use MLX

To enter the 64 version of Demons of Osiris, you *must* first LOAD and RUN MLX, the Machine Language Editor (which can be found elsewhere in this issue). When the MLX program asks for the starting and ending addresses of Demons, enter 49152 and 51005, respectively. After you've entered Demons with MLX and SAVEd it to tape or disk, you can get it back by typing LOAD "DEMONS",1,1 (for tape) or LOAD "DEMONS",8,1 (for disk). Type SYS 49152 to start the game.

Demons of Osiris was written entirely in machine language using modular programming. The program consists of a series of routines (modules) which are executed from a main or "master" loop. This programming technique allows you to test routines as individual units. Once you decide that one routine works correctly, then you can start on the next routine. Modules used within this program include a routine to detect collision between sprites and other sprites, routines to detect collision between characters and sprites, and a routine to let any of the eight sprites cross the notorious seam on the right of the screen (sprite X–position 255).

The demons appear to wiggle their claws as they descend toward your base. This is accomplished by changing the pointer which defines the location in memory of a particular sprite image. Each of two areas contains slightly different "pictures" of the demons. By alternating rapidly between these pictures (by changing the sprite pointers), we can easily animate the crab-like demons.

Program 2: Demons Of Osiris For The 64

Version by Gregg Peele, Assistant Programming Supervisor

```
49152 :169,000,162,024,157,000,000
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49164 :198,169,001,141,033,208,250
49170 :169,147,032,210,255,169,232
49176 :000,141,102,003,169,000,183
49182 :141,142,003,141,143,003,091
49188 :169,000,162,255,157,000,011
49194 :206,157,000,207,202,208,254
49200 :247,169,225,141,096,207,109
49206 :169,000,141,097,207,169,069
49212 :192,141,248,007,169,001,050
49218 :141,039,208,032,017,196,187
49224 :032,080,196,032,181,196,021
49230 :032,010,194,169,000,141,112
49236 :209,207,169,255,141,021,062
49242 :208,024,169,000,141,098,218
49248 :207,105,036,141,100,207,124
49254 :105,036,141,102,207,105,030
49260 :036,141,104,207,105,036,225
49266 :141,106,207,105,036,141,082
49272 :108,207,105,036,141,110,059
49278 :207,169,002,141,092,003,228
49284 :169,144,032,210,255,169,087
49290 :165,141,000,207,169,000,052
49296 :141,001,207,169,015,141,050
49302 :024,212,169,017,141,005,206
49308 :212,169,248,141,006,212,120
49314 :169,005,141,000,212,141,062
49320 :005,212,169,020,141,152,099
49326 :003,169,000,141,032,208,215
49332 :173,030,208,173,031,208,235
49338 :032,230,192,032,069,193,166
49344 :032,168,193,032,209,193,251
49350 :172,083,003,140,102,003,189
49356 :032,075,194,032,108,194,071
49362 :032,046,195,032,059,195,001
49368 :032,191,195,032,227,197,066
49374 :206,102,003,208,233,076,026
49380 :186,192,162,014,056,189,003
49386 :000,207,233,000,157,032,095
49392 :207,189,001,207,233,001,054
49398 :029,032,207,176,018,173,113
49404 :016,208,061,039,193,141,142
49410 :016,208,189,000,207,157,011
49416 :000,208,076,028,193,189,190
49422 :000,207,157,000,208,189,007
49428 :054,193,013,016,208,141,133
49434 :016,208,189,096,207,157,131
49440 :001,208,202,202,016,194,087
49446 :096,254,000,253,000,251,124
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49464 :002,000,004,000,008,000,070
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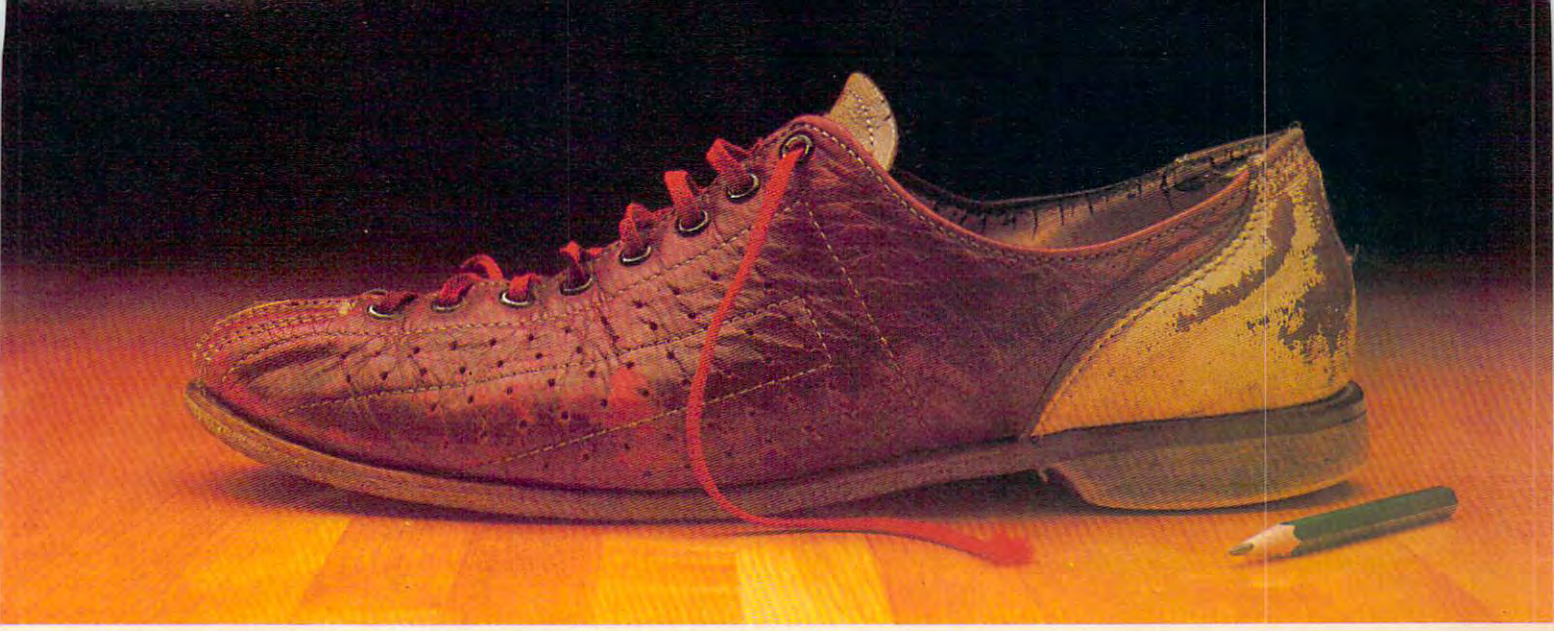

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Oh sure—it might look silly now. But wait'll it's hurtling toward you, threatening to destroy your perfect game. You'll take it seriously then.

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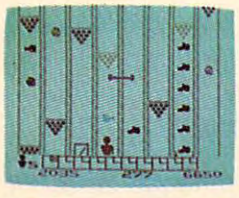

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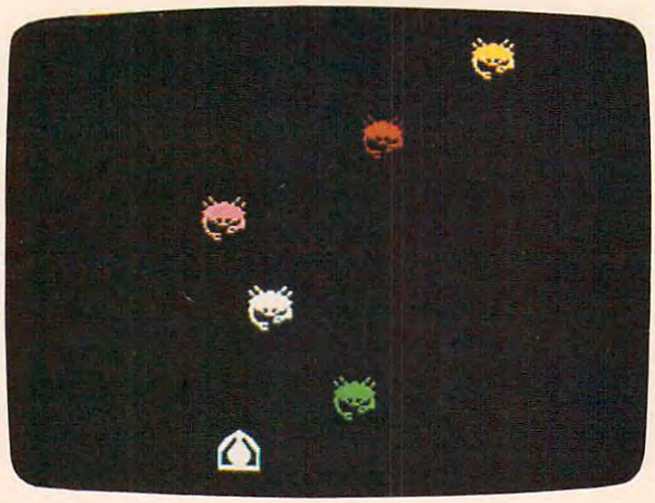

64 version of "Demons of Osiris."

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49554 :064,003,144,017,056,173,091
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49566 :207,173,001,207,233,000,211
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49608 :193,207,110,192,207,136,221
49614 :208,247,096,173,076,003,241
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49686 :141,252,007,141,253,007,055
49692 :141,254,007,141,255,007,065
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49722 :208,169,010,141,044,208,070
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50148 :195,202,224,010,176,243,254
50154 :169,032,141,004,212,169,193
50160 :005,141,001,212,169,001,001
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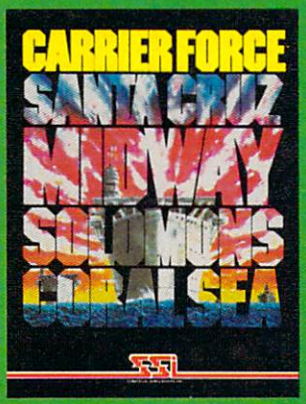

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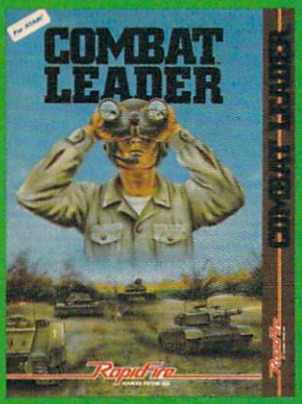

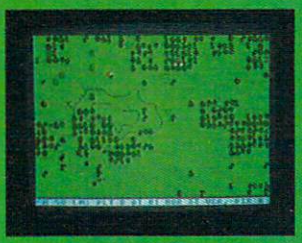

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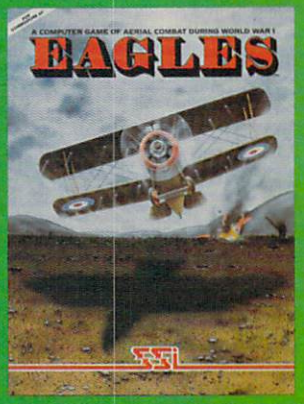

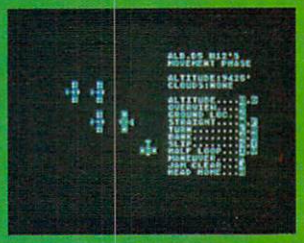

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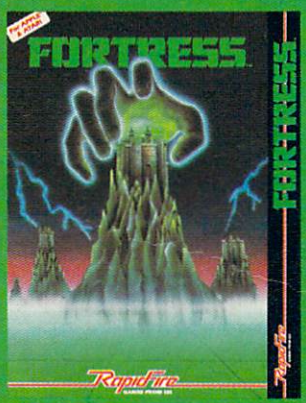

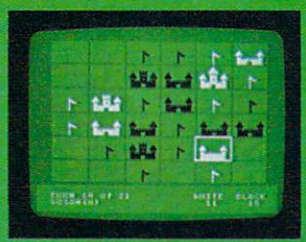

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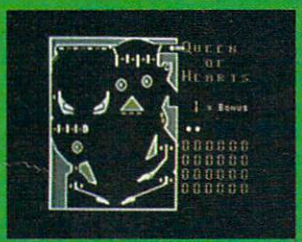

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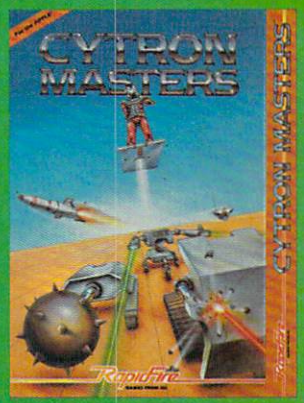

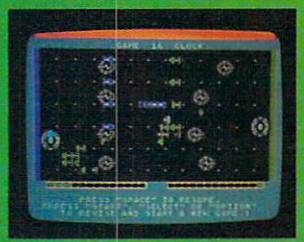

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50172 :210,255,169,002,141,033,038
50178 :208,169,000,141,033,208,249
50184 :206,137,003,208,003,076,129
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50298 :245,141,133,003,169,144,189
50304 :032,210,255,162,006,160,185
50310 :026,032,240,255,173,133,225
50316 :003,032,210,255,160,010,042
50322 :140,132,003,032,049,196,186
50328 :056,173,133,003,233,048,030
50334 :010,010,010,024,105,010,071
50340 :141,083,003,096,076,005,056
50346 :022,005,012,058,049,032,092
50352 :084,079,032,054,063,162,138
50358 :017,189,090,197,157,234,042
50364 :005,160,000,152,157,234,128
50370 :217,202,016,241,169,032,047
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50388 :241,201,058,176,237,141,242
50394 :134,003,162,012,160,030,207
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50406 :032,210,255,032,228,255,218
50412 :201,013,240,078,201,048,249
50418 :144,245,201,058,176,241,027
50424 :141,135,003,162,012,160,093
50430 :031,032,240,255,173,135,096
50436 :003,032,210,255,056,173,221
50442 :134,003,233,048,141,134,191
50448 :003,056,173,135,003,233,107
50454 :048,141,135,003,173,134,144
50460 :003,010,141,137,003,010,076
50466 :010,024,109,137,003,024,085
50472 :109,135,003,141,137,003,056
50478 :240,150,160,010,140,132,110
50484 :003,032,049,196,169,147,136
50490 :032,210,255,096,173,134,190
50496 :003,056,233,048,141,137,170
50502 :003,240,014,160,010,140,125
50508 :132,003,032,049,196,169,145
50514 :147,032,210,255,096,076,130
50520 :198,196,032,032,078,021,133
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50538 :019,063,169,147,032,210,234
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50562 :005,169,000,157,039,217,205
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50580 :003,174,142,003,169,000,127
50586 :141,134,002,032,205,189,089
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50658 :032,032,007,198,206,152,085
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50670 :173,152,003,201,010,176,185
50676 :006,169,193,141,162,003,150
50682 :096,169,194,141,162,003,247
50688 :096,169,020,141,152,003,069
50694 :096,162,006,173,162,003,096
50700 :157,249,007,202,016,247,122
50706 :096,162,255,189,060,198,210
50712 :157,000,048,202,208,247,118
50718 :162,010,189,060,198,157,038
50724 :000,048,202,016,247,096,133
50730 :169,000,133,198,032,144,206
50736 :195,165,197,201,003,240,025
50742 :250,201,064,240,246,096,127
50748 :000,000,000,000,000,000,060
50754 :000,000,000,000,000,000,066
50760 :000,028,000,000,127,000,227
50766 :001,255,192,007,156,240,161
50772 :015,028,120,030,062,060,143
50778 :060,127,030,120,255,143,057
50784 :113,255,199,099,255,227,220
50790 :099,255,227,099,255,227,240
50796 :097,255,195,096,255,131,113
50802 :096,127,003,127,255,255,209
50808 :127,255,255,255,024,000,012
50814 :024,012,000,048,195,060,209
50820 :195,099,255,198,031,255,141
50826 :248,063,255,252,255,255,186
50832 :255,127,255,254,127,255,137
50838 :254,239,024,247,225,153,012
50844 :135,096,126,015,096,001,113
50850 :255,048,003,048,056,003,063
50856 :192,015,224,000,003,000,090
50862 :000,001,224,000,000,000,143
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50922 :003,248,000,000,096,000,069
50928 :003,192,000,000,000,000,179
50934 :000,000,000,000,000,255,245
50940 :000,000,000,006,195,096,037
50946 :000,000,000,048,219,012,025
50952 :000,102,000,000,219,096,169
50958 :000,060,000,182,219,109,072
50964 :001,153,128,048,219,012,069
50970 :000,060,000,054,219,108,211
50976 :000,102,000,024,219,012,133
50982 :000,000,128,006,195,096,207
50988 :000,000,000,000,000,000,044
50994 :000,000,000,000,000,000,050
51000 :000,000,000,255,000,013,068
```
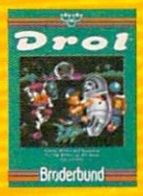

Betcha Can't Play Just One!



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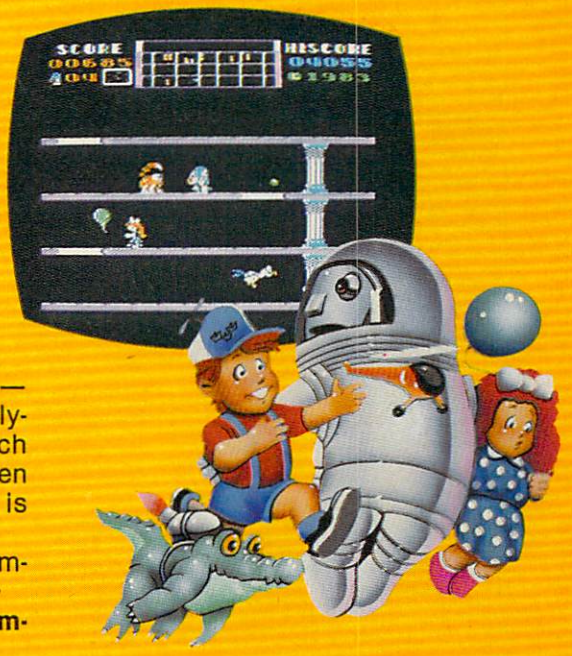

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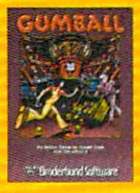

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Programming Notes, Atari Version

John Krause, Assistant Technical Editor

The Atari version of "Demons of Osiris" (Program 3) is similar to the VIC version. The only major difference is in controlling the base ship. The ship is controlled using the joystick plugged into port 1. The joystick fire button launches the missiles. Hold down the button for rapid fire. When you RUN the program, you will have to wait a few seconds for the computer to POKE in the machine language (ML) portion of the game. Then it will prompt you to enter the speed of play and number of base ships. Enter a speed from 0 (fastest) to 255 (slowest) and specify from 1 to 255 ships.

Press the fire button to start the game. Pressing the space bar will pause the game until you press any other key. When a demon hits your ship, the ship will be destroyed, the screen will flash, and another ship will appear at the middle of the screen. Each demon you hit with your missiles is worth ten points. After all your ships are destroyed, the final score will be displayed.

The program consists mostly of machine language, which line 20 READs from the DATA statements and POKEs into the buffer at locations 14592–15380. Lines 130–160 contain the information for the redefined characters. BASIC is used for things that do not require the speed of machine language, such as the input prompts and displaying the final score. The speed and number of ships are POKEd into memory so the ML routine can access this information during play. Line 70 executes the ML routine. When the game ends, line 80 will calculate the score from the values stored by the ML routine.

Program 3: Demons Of Osiris For Atari

Version by John Krause, Assistant Technical Editor

```
10 POKE 106,64:GRAPHICS 0
15 ? "Demons of Osiris"
17 IF PEEK(14592)=169 THEN 50
18 ? :? "Please wait 15 seconds."
20 RESTORE 14592:FOR I=14592 TO 1538
   0:READ A:C=C+A:POKE I,A:NEXT I:GO
   SUB 100
25 IF C<>98549 THEN ? "Error in DATA
   ":END
50 POKE 764,255:TRAP 50:? "Speed";:I
   NPUT I:POKE 208,I
60 TRAP 60:? "Ships";:INPUT I:IF I=0
   THEN 60
61 POKE 207,I
62 ? :? "Press FIRE:";
64 IF STRIG(0) THEN 64
65 POKE 710,0
70 POKE 752,1:? CHR$(125):TRAP 80:PO
   KE 756,4:I=USR(14592)
80 GRAPHICS 0:? "Score:";10*PEEK(135
   27)+2560*PEEK(13526)
90 GOTO 50
100 RESTORE 130
110 FOR I=1 TO 4:READ A:A=1024+A*8:F
    OR J=0 TO 7:READ B:POKE A+J,B:NE
    XT J:NEXT I
120 RETURN
130 DATA 84,24,126,219,255,126,102,6
    6,195
140 DATA 92,0,0,24,24,24,24,0,0
150 DATA 33,24,24,24,60,60,60,126,25
    5
160 DATA 0,0,0,0,0,0,0,0,0
14592 DATA 169,52,133,204,169,0
14598 DATA 133,203,168,145,203,200
14604 DATA 192,0,208,249,230,204
14610 DATA 166,204,224,57,208,241
14616 DATA 169,63,133,204,169,236
14622 DATA 133,203,169,20,141,223
14628 DATA 52,160,0,152,145,203
14634 DATA 173,120,2,41,4,208
14640 DATA 12,173,223,52,201,0
14646 DATA 240,5,206,223,52,198
14652 DATA 203,173,120,2,41,8
14658 DATA 208,12,173,223,52,201
14664 DATA 39,240,5,238,223,52
14670 DATA 230,203,169,33,160,0
14676 DATA 145,203,238,222,52,169
14682 DATA 2,205,222,52,16,3
14688 DATA 140,222,52,173,132,2
14694 DATA 201,1,240,49,174,221
14700 DATA 52,189,0,53,201,1
14706 DATA 240,39,173,222,52,201
14712 DATA 2,48,32,169,1,157
14718 DATA 0,53,165,204,157,8
14724 DATA 53,165,203,56,233,40
14730 DATA 157,16,53,238,221,52
14736 DATA 169,7,205,221,52,16
14742 DATA 4,152,141,221,52,162
14748 DATA 0,142,217,52,189,0
14754 DATA 53,201,0,240,40,189
14760 DATA 16,53,133,205,189,8
14766 DATA 53,133,206,152,145,205
14772 DATA 32,222,59,145,205,189
14778 DATA 8,53,201,60,208,18
14784 DATA 189,16,53,201,0,48
14790 DATA 11,201,104,16,7,152
14796 DATA 157,0,53,76,48,58
14802 DATA 189,16,53,56,233,40
14808 DATA 157,16,53,176,3,222
14814 DATA 8,53,133,205,189,8
14820 DATA 53,133,206,32,222,59
14826 DATA 177,205,141,216,52,201
14832 DATA 2,16,26,189,16,53
14838 DATA 133,205,189,8,53,133
14844 DATA 206,169,92,145,205,32
14850 DATA 222,59,138,24,105,9
14856 DATA 145,205,76,48,58,152
14862 DATA 157,0,53,174,216,52
14868 DATA 202,157,232,52,189,248
14874 DATA 52,133,205,189,240,52
14880 DATA 133,206,152,145,205,32
```

25 of The Hundreds of Reasons You Ought To Be A **COMPUTE!** Magazine Subscriber:

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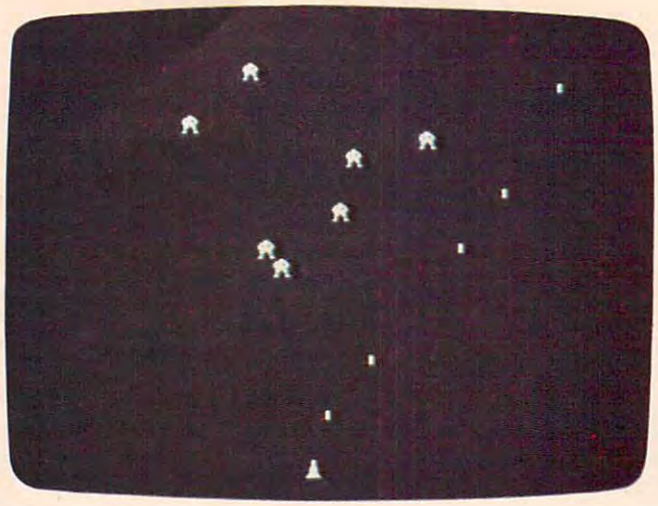

Atari version of "Demons of Osiris."

```
14886 DATA 222,59,145,205,32,2
14892 DATA 60,32,243,59,238,217
14898 DATA 52,174,217,52,224,8
14904 DATA 240,3,76,160,57,173
14910 DATA 10,210,201,0,16,48
14916 DATA 174,220,52,169,1,221
14922 DATA 232,52,240,38,157,232
14928 DATA 52,169,60,157,240,52
14934 DATA 173,10,210,41,31,24
14940 DATA 105,4,157,224,52,24
14946 DATA 105,64,157,248,52,238
```



```
14952 DATA 220,52,169,7,205,220
14958 DATA 52,16,3,140,220,52
14964 DATA 162,0,142,217,52,189
14970 DATA 232,52,201,0,208,3
14976 DATA 76,172,59,189,240,52
14982 DATA 201,63,208,100,189,248
14988 DATA 52,201,0,16,93,201
14994 DATA 176,48,89,152,157,232
15000 DATA 52,189,248,52,133,205
15006 DATA 189,240,52,133,206,152
15012 DATA 145,205,32,222,59,145
15018 DATA 205,189,224,52,24,105
15024 DATA 1,205,223,52,16,3
15030 DATA 76,172,59,56,233,3
15036 DATA 205,223,52,48,3,76
15042 DATA 172,59,169,8,141,198
15048 DATA 2,198,207,32,2,60
15054 DATA 152,141,198,2,152,145
15060 DATA 203,169,63,133,204,169
15066 DATA 236,133,203,169,20,141
15072 DATA 223,52,169,33,145,203
15078 DATA 196,207,240,3,76,172
15084 DATA 59,96,140,219,52,189
15090 DATA 224,52,205,223,52,208
15096 DATA 8,152,205,10,210,16
15102 DATA 13,48,27,173,223,52
15108 DATA 24,105,1,221,224,52
15114 DATA 16,5,169,255,141,219
15120 DATA 52,189,224,52,24,105
15126 DATA 1,205,223,52,16,5
15132 DATA 169,1,141,219,52,152
15138 DATA 205,10,210,16,3,141
15144 DATA 219,52,189,224,52,24
15150 DATA 109,219,52,157,224,52
15156 DATA 189,248,52,133,205,189
15162 DATA 240,52,133,206,152,145
15168 DATA 205,32,222,59,145,205
15174 DATA 173,219,52,24,105,40
15180 DATA 24,125,248,52,157,248
15186 DATA 52,144,3,254,240,52
15192 DATA 189,248,52,133,205,189
15198 DATA 240,52,133,206,32,222
15204 DATA 59,177,205,141,216,52
15210 DATA 201,9,16,23,138,24
15216 DATA 105,1,145,205,189,248
15222 DATA 52,133,205,189,240,52
15228 DATA 133,206,169,84,145,205
15234 DATA 76,172,59,152,157,232
15240 DATA 52,173,216,52,56,233
15246 DATA 9,170,152,157,0,53
15252 DATA 189,16,53,133,205,189
15258 DATA 8,53,133,206,152,145
15264 DATA 205,32,222,59,145,205
15270 DATA 32,2,60,32,243,59
15276 DATA 238,217,52,174,217,52
15282 DATA 224,8,240,3,76,121
15288 DATA 58,165,208,32,200,59
15294 DATA 173,252,2,201,33,240
15300 DATA 249,76,39,57,141,213
15306 DATA 52,162,255,160,0,200
15312 DATA 192,0,208,251,232,236
15318 DATA 213,52,208,245,174,217
15324 DATA 52,96,165,206,56,233
15330 DATA 7,133,206,165,205,56
15336 DATA 233,40,133,205,176,2
15342 DATA 198,206,169,0,96,173
15348 DATA 215,52,24,105,1,141
15354 DATA 215,52,144,3,238,214
15360 DATA 52,96,169,15,141,1
15366 DATA 210,169,20,141,0,210
15372 DATA 169,64,32,200,59,140
15378 DATA 1,210,96
```

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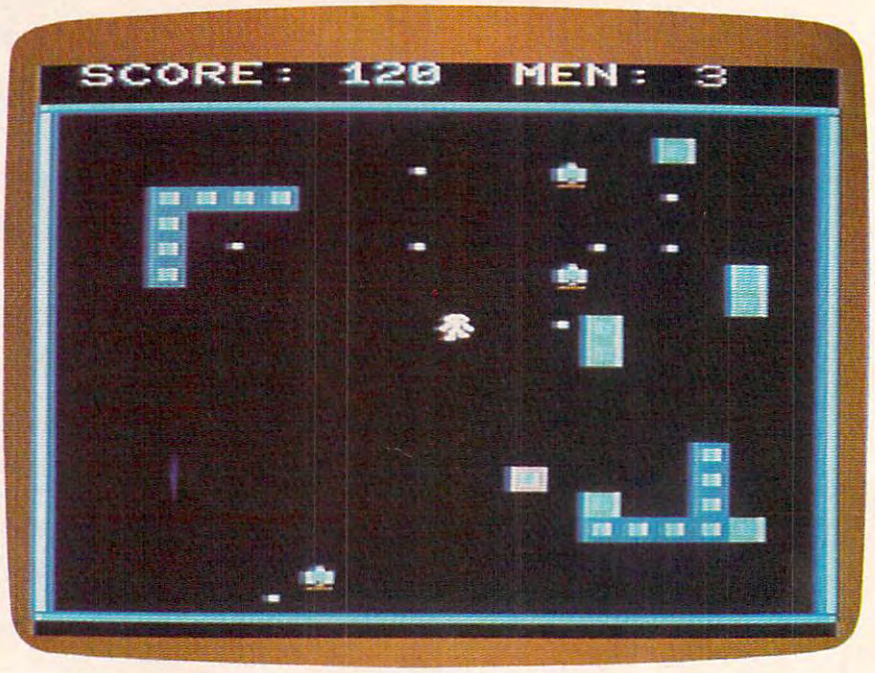
COLORBOT

John R. Dondzila

"Colorbot" is an exciting game for the unexpanded VIC-20, Commodore 64, or Atari which features extensive use of multicolor graphics and sound effects. The game is for one player and requires a joystick. The longer the game is played, the harder it becomes to win.



Three robots pressure the player in the VIC version of "Colorbot."

In the year 1987 man has overpopulated the world with TVs, videogames, home computers, and every electronic device manufacturable.

Through an incredible genetic experiment, all of these surplus electronics have mutated into the Colorbots, a hyper-intelligent race of robots who are capable of thinking on their own. The Colorbots have concluded that—according to their alien logic—man is inferior and must be destroyed.

After noting man's vulnerability to electricity and then supercharging Earth with a high-voltage proton forcefield, these creatures of man's invention have turned all matter into glowing debris.

You and some others, however, have somehow become partially immune to the Colorbot forces. Armed with a supply of stolen Electron Frisbees, you will try to destroy the Colorbots before they destroy all of mankind.

Defeating The Colorbots

You are positioned in the center of the playfield. Positioned elsewhere on the playfield are three Colorbot warriors. You can move your man in any direction by positioning the joystick in that direction. (Use joystick 2 on the 64 and joystick 1 on the Atari.) To fire an Electron Frisbee, simply hold down the fire button and push the joystick in the direction that you want to fire.

Also on the playfield is a random display of flashing high-voltage walls, which neither you nor the Colorbots can walk into without being destroyed.

The Colorbots are programmed to follow you. Try to lead the robots into the walls so that they destroy themselves. Whenever a Colorbot is destroyed (whether by you or its own foolish bravado), you gain ten points and a new Colorbot appears somewhere else on the screen. The walls gradually decrease in number as the game progresses.

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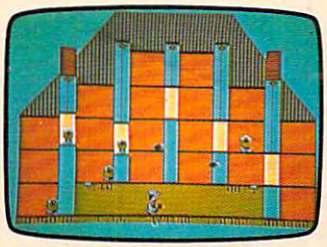

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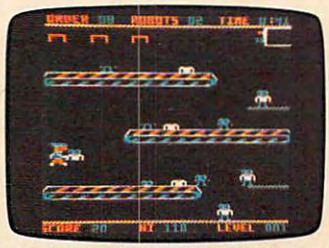

PANIC BUTTON™
TRS-80 Color Computer
by Paul Kanevsky
Commodore Computers

*Electronic Games Magazine 1984 Game Of The Year Award

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Every now and then a Colorbot leaves behind a small Colorbomb, which is fatal if you walk on it. The more Colorbots destroyed, the faster they will get. After a while only one or two Colorbots will chase you, and they chase fast.

When you begin the game, you are given four men. If you are destroyed you lose a man. Lose all of your men and the game is over and mankind is doomed to extinction. You lose a man if you walk into anything that is glowing or flashing in different colors. You receive a free man plus 100 bonus points if you score 200 or 800 points.

Using The Programs

Colorbot is written entirely in BASIC except for one small machine language routine installed right on top of the custom character set. This routine is used to continuously change the auxiliary color set without delaying the game.

Please note that you must first type in Program 1 and SAVE it. This program installs the custom character set and machine language routine. After saving it, type NEW and enter the second program. Save this on tape right after Program 1. You may now LOAD and RUN Program 1. It will perform its task and then LOAD and run Program 2 automatically.

If you have a disk drive, type in Program 1 (delete line 140) and SAVE it. Then ENTER Program 2 and SAVE it. RUN Program 1 to define the custom characters. When it is finished, LOAD and RUN Program 2.

One last thing: There are lots of sound effects in this program, so make sure you have the TV volume turned up. This program also has the best visual effect on a color TV or monitor.

BEGINNING PROGRAMMERS

If you're new to computing, please read "How To Type COMPUTE!'s Programs" and "A Beginner's Guide To Typing In Programs."

Program 1: VIC Character Loader

```
10 POKE55,0:POKE56,29:CLR
15 POKE36869,240:POKE36879,10:PRINT"{CLR}
   {2 DOWN}{CYN}COLORBOT"
20 PRINT"{2 DOWN}{WHT}LOADING THE":PRINT"
   MAIN CHARACTER SET"
25 DATA0,0,0,0,0,0,0,0
30 DATA56,84,56,84,146,40,104,12
35 DATA56,84,56,84,146,40,44,96
40 DATA0,0,32,184,32,0,0,0
45 DATA4,8,63,63,46,38,4,21
50 DATA0,0,48,48,0,0,0,0
55 DATA0,0,0,0,0,255,255,170
60 DATA224,224,224,224,224,224,224,224
65 DATA11,11,11,11,11,11,11,11
70 DATA170,255,255,0,0,0,0,0
75 DATA170,170,190,190,190,190,170,170
80 DATA141,253,29,238,255,29,173,255
85 DATA29,201,255,208,6,173,253,29
90 DATA76,191,234,238,254,29,173,254
95 DATA29,201,2,208,240,169,0,141
100 DATA254,29,24,173,14,144,105,16
105 DATA141,14,144,76,104,29,14,144
110 DATA201,224,48,5,169,15,141,14
115 DATA144,174,252,29,76,104,29
120 FORI=0TO150:READX
125 POKE7424+I,X:NEXTI
130 PRINT"{CLR}{2 DOWN}DONE, NOW LOAD THE
    ":PRINT"MAIN PROGRAM..."
135 PRINT
140 POKE198,1:POKE631,131:END
145 REM IF YOU ARE USING A DISK DRIVE DEL
    ETE LINE 140
146 REM THEN LOAD & RUN PART 2
```

Program 2: VIC Colorbot, Main Program

```
10 POKE7679,1:POKE7678,1
15 POKE37158,200:POKE37159,200
20 POKE37166,128:POKE788,88:POKE789,29:PO
   KE37166,192
25 POKE36878,15:POKE36869,255:POKE36879,1
   0
30 DIMX(3),Y(3),Z(4):FORI=1TO3:DEFFNP(I)=
   7680+X(I)+22*Y(I)
35 A=0:C=30720:DEFFNQ(A)=7680+X+22*Y:X1=3
   3:SL=10:S1=5:S2=15:MN=4
40 FORI=1TO4:READZ(I):NEXT:DATA150,160,18
   0,200
45 PRINT"{CLR}":FORI=1TOS2:R=7724+RND(1)*
   374:POKER,42:POKER+C,11+RND(1)*3
50 POKE36876,200+RND(1)*50:NEXT:POKE36876
   ,0
55 FORI=7702TO7723:POKEI,38:POKEI+C,14:PO
   KEI+462,41:POKEI+C+462,14:NEXT
60 FORI=7724TO8142STEP22:POKEI,39:POKEI+C
   ,14:POKEI+21,40:POKEI+C+21,14:NEXT
65 POKE646,14:PRINT"{HOME}{5 DOWN}
   {3 RIGHT}****{3 LEFT}{DOWN}{LEFT}*
   {DOWN}{LEFT}*{DOWN}{LEFT}*"
70 PRINT"{6 DOWN}{18 RIGHT}*{DOWN}{LEFT}*
   {DOWN}{LEFT}*{DOWN}{LEFT}*{4 LEFT}****
   "
75 POKE646,0
80 H=0:X=10:Y=10
85 FORI=1TO3:X(I)=INT(RND(1)*18)+3:Y(I)=I
   NT(RND(1)*19)+3:NEXTI
90 GOSUB430:POKE37154,127
95 FORI=1TO3:POKEFNP(I),36:POKEFNP(I)+C,1
   3:NEXT
100 POKEFNQ(0),X1:POKEFNQ(0)+C,1:FORI=128
    TO254:POKE36874,I:NEXT:POKE36874,0:Z1
    =1
105 FORI=1TO3:POKEFNP(I),36:POKEFNP(I)+C,
    13:NEXT
110 POKEFNQ(0),X1:POKEFNQ(0)+C,1
115 GOSUB440
120 IFF=1THEN205
125 IFJ0=1THENGOSUB475:GOSUB450
130 IFJ1=1THENGOSUB485:GOSUB450
135 IFJ2=1THENGOSUB495:GOSUB450
140 IFJ3=1THENGOSUB505:GOSUB450
145 POKE36875,0
150 IFH=1THEN325
155 R=INT(RND(1)*SL)+1:IFR>3THENGOTO105
```

Wargames

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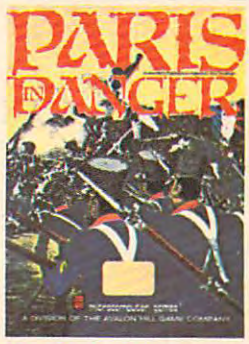
The Avalon Hill Game Company, America's premiere strategy game maker, has combined their years of experience designing military strategy board games with the latest in artificial intelligence for home computers. The resulting computer games are designed to assist you, the player, with combat results, lines of fire and double hidden movement in two player games and provide a worthy opponent in solitaire games.



Strategic Level

Paris in Danger: A simulation of Napoleon's 1814 campaign in France. One of Napoleon's finest, against the invading Allied Armies. (Austrian, Prussian and Russian). You can choose to take the role as Napoleon, Commander Schwarzenberg, or play both sides to re-create the actual campaign. PARIS IN DANGER is unique, in that it allows the players to compete on both the strategic and tactical levels, on a full-color scrolling map of France and surrounding countries.

For all Atari Home Computers, 48K Disk: $35.00

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LEGIONNAIRE (by Chris Crawford):

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For all Atari Home Computers, 16K Cassette: $35.00
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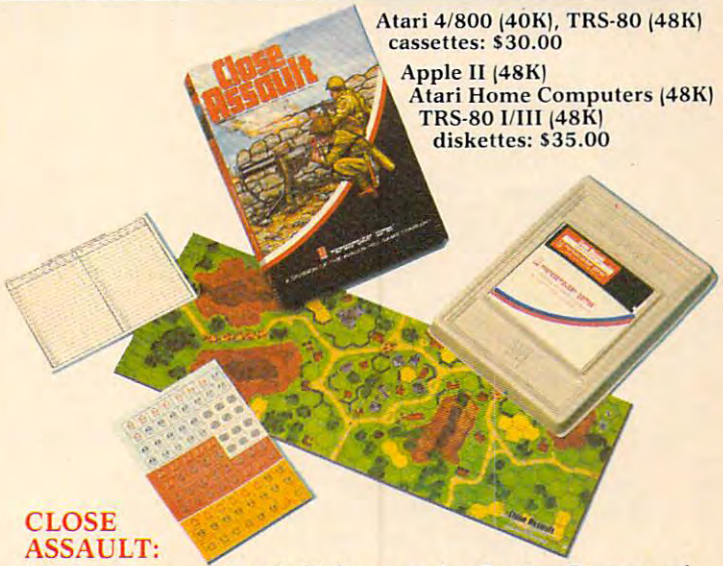

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```
160 POKEFNP(R),32:POKE36874,128+(R*20)
165 IFINT(RND(1)*S1)=1THENPOKEFNP(R),37:P
    OKEFNP(R)+C,44
170 IFX<X(R)THENX(R)=X(R)-1
175 IFX>X(R)THENX(R)=X(R)+1
180 IFY<Y(R)THENY(R)=Y(R)-1
185 IFY>Y(R)THENY(R)=Y(R)+1
190 POKE36874,0:IFX(R)=XANDY(R)=YTHENGOTO
    325
195 IFPEEK(FNP(R))=42THENFORI=254TO240STE
    P-.8:POKE36874,I:NEXT:POKE36874,0:I=R
    :GOTO290
200 GOTO105
205 B=X:D=Y
210 IFJ0=0ANDJ1=0ANDJ2=0ANDJ3=0THEN155
215 GOTO225
220 POKE7680+B+22*D,32
225 IFJ0=1THENB=B+1
230 IFJ1=1THEND=D+1
235 IFJ2=1THENB=B-1
240 IFJ3=1THEND=D-1
245 IFPEEK(7680+B+22*D)>35THEN260
250 POKE7680+B+22*D,35:POKE38400+B+22*D,1
    5
255 FORO=1TO2:NEXT:GOTO220
260 P=7680+B+22*D:P1=PEEK(P)
265 IFP1>37THEN155
270 FORO=250TO210STEP-3:POKE36877,O:POKEP
    ,RND(1)*255:NEXT:POKE36877,0
275 IFP1=37THENPOKEP,32:GOTO155
280 POKEP,32:FORI=1TO3:IFX(I)=BANDY(I)=DT
    HEN290
285 NEXT:GOTO155
290 X(I)=INT(RND(1)*18)+3:Y(I)=INT(RND(1)
    *19)+3
295 SC=SC+10:IFSC=200ORSC=800THENGOSUB415
300 GOSUB430:FORO=1TO400:NEXT:POKEFNP(I),
    36:POKEFNP(I)+C,13:FORO=250TO140STEP-
    8
305 POKE36876,O:NEXT:POKE36876,0
310 SL=SL-.2:IFSL<1THENSL=1
315 S1=S1-.2:IFS1<2THENS1=2
320 GOTO155
325 MN=MN-1:GOSUB430
330 FORQ1=1TO16:FORQ2=180TO240STEP6:POKE3
    6876,Q2:NEXT:POKEFNQ(0)+C,1+RND(1)*8
335 NEXT
340 POKE36876,0:POKEFNQ(0),32
345 S2=S2-5
350 IFMN<>0THEN45
355 POKE646,10
360 PRINT"{HOME}";:FORI=1TO22:PRINT"*****
    ****************";:NEXT:FORI=8164TO8
    185:POKEI,42
365 POKEI+C,10:NEXT
370 POKE36879,14:PRINT"{WHT}{HOME}
    {5 DOWN}{6 RIGHT}{RVS}GAME{2 SPACES}O
    VER"
375 PRINT"{2 DOWN}{2 RIGHT}{RVS}PLAY AGAI
    N{SHIFT-SPACE}(Y/N){SHIFT-SPACE}?"
380 FORQ1=128TO254:POKE36875,Q1:POKE36875
    ,Q1-10:NEXT:POKE36875,0
385 POKE37154,255
390 GETA$:IFA$<>"Y"ANDA$<>"N"THEN390
395 IFA$="Y"THENRUN
400 SYS65418
405 POKE37158,137:POKE37159,66
410 POKE36879,27:POKE36869,240:PRINT"
    {CLR}{BLU}":END
415 MN=MN+1:SC=SC+100:GOSUB430
420 FORQ1=1TO10:POKE36876,240:FORQ2=1TO80
    :NEXT:POKE36876,0:FORQ2=1TO80:NEXT:NE
    XT
425 RETURN
430 PRINT"{HOME}{YEL}{RVS} SCORE:{CYN}";S
    C;" {YEL}MEN:{PUR}";MN;"{SHIFT-SPACE}
    {OFF}";
435 RETURN
440 P=PEEK(37152)AND128:J0=-(P=0):P=PEEK(
    37151):J1=-((PAND8)=0):J2=-((PAND16)=
    0)
445 J3=-((PAND4)=0):F=-((PAND32)=0):RETUR
    N
450 X1=X1+1:IFX1>34THENX1=33
455 Z1=Z1+1:IFZ1>4THENZ1=1
460 POKE36875,Z(Z1)
465 IFPEEK(FNQ(0))>34THENH=1
470 POKEFNQ(0),X1:POKEFNQ(0)+C,1:RETURN
475 POKEFNQ(0),32:X=X+1:IFX>20THENX=X-1:H
    =1
480 RETURN
485 POKEFNQ(0),32:Y=Y+1:IFY>21THENY=Y-1:H
    =1
490 RETURN
495 POKEFNQ(0),32:X=X-1:IFX<1THENX=X+1:H=
    1
500 RETURN
505 POKEFNQ(0),32:Y=Y-1:IFY<2THENY=Y+1:H=
    1
510 RETURN
```

Program 3: Colorbot For The 64

Translation by Kevin Martin, Editorial Programmer

```
1 POKE52,48:POKE56,48:CLR:POKE53280,15:PO
  KE53281,0
2 PRINT"{CLR}{WHT}{12 DOWN}{9 RIGHT}REDEF
  INING{2 SPACES}CHARACTERS"
3 PRINT"{HOME}{7 DOWN}{16 RIGHT}COLORBOT"
  :GOSUB1000
4 DIMX(3),Y(3),Z(4):X=RND(0)
5 Z(1)=150:Z(2)=160:Z(3)=180:Z(4)=200
7 C=54272:FORI=CTOC+24:POKEI,0:NEXT
8 POKEC+24,15:POKEG+5,17:POKEC+6,240:POKE
  C,100
20 POKE56333,127:POKE788,88:POKE789,49:PO
   KE56333,129
25 POKE53280,2:POKE53281,0
30 FORI=1TO3:DEFFNP(I)=1024+X(I)+40*Y(I)
35 A=0:DEFFNQ(A)=1024+X+40*Y:X1=33:SL=10:
   S1=5:S2=15:MN=4
45 PRINT"{CLR}":FORI=1TOS2:R=1104+RND(1)*
   880:POKER,42:POKER+C,11+RND(1)*3
50 POKEC+1,100+RND(1)*50:POKEC+4,17:NEXT:
   POKEC+4,16
55 FORI=1064TO1103:POKEI,38:POKEI+C,14:PO
   KEI+920,41:POKEI+C+920,14:NEXT
60 FORI=1104TO1944STEP40:POKEI,39:POKEI+C
   ,14:POKEI+39,40:POKEI+C+39,14:NEXT
65 PRINT"{HOME}{7}{5 DOWN}{3 RIGHT}****
   {3 LEFT}{DOWN}{LEFT}*{DOWN}{LEFT}*
   {DOWN}{LEFT}*"
70 PRINT"{7}{7 DOWN}{33 RIGHT}*{DOWN}
   {LEFT}*{DOWN}{LEFT}*{DOWN}{LEFT}*
   {4 LEFT}****"
80 H=0:X=20:Y=10
85 FORI=1TO3:X(I)=INT(RND(1)*36)+3:Y(I)=I
   NT(RND(1)*19)+3:NEXTI
90 GOSUB430
```

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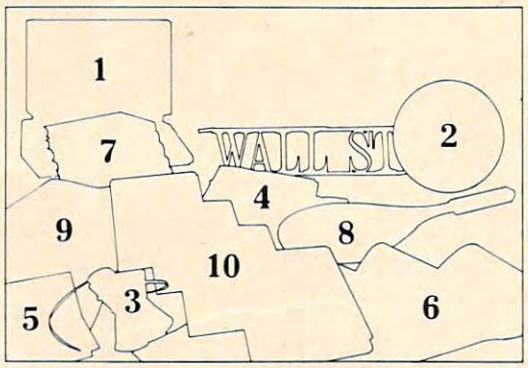

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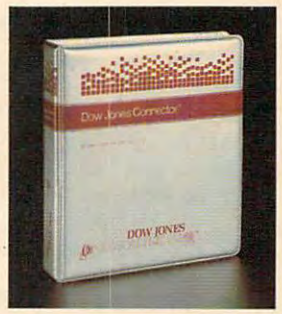

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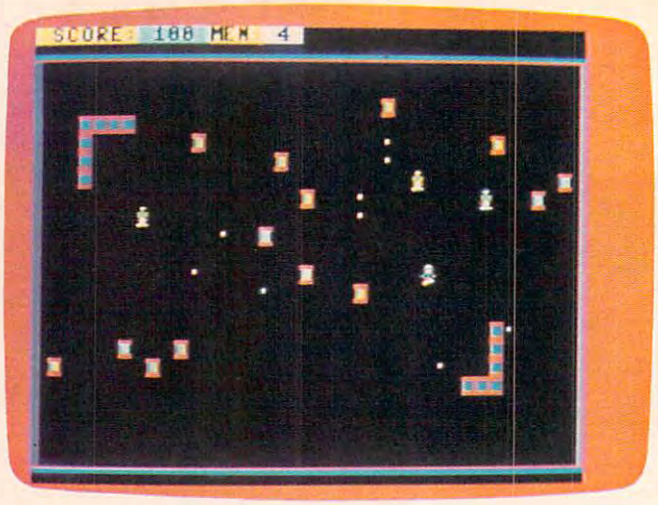
```
95 FORI=1TO3:POKEFNP(I),36:POKEFNP(I)+C,1
   3:NEXT
100 POKEFNQ(0),X1:POKEFNQ(0)+C,1:Z1=1
105 FORI=1TO3:POKEFNP(I),36:POKEFNP(I)+C,
    13:NEXT
110 POKEFNQ(0),X1:POKEFNQ(0)+C,1
115 GOSUB440
120 IFF=1THEN205
125 IFJ0=1THENGOSUB475:GOSUB450
130 IFJ1=1THENGOSUB485:GOSUB450
135 IFJ2=1THENGOSUB495:GOSUB450
140 IFJ3=1THENGOSUB505:GOSUB450
145 POKEC+4,16
150 IFH=1THEN325
155 R=INT(RND(1)*SL)+1:IFR>3THENGOTO105
160 POKEFNP(R),32:POKEC+1,80+(R*20):POKEC
    +4,17
165 IFINT(RND(1)*S1)=1THENPOKEFNP(R),37:P
    OKEFNP(R)+C,44
170 IFX<X(R)THENX(R)=X(R)-1
175 IFX>X(R)THENX(R)=X(R)+1
180 IFY<Y(R)THENY(R)=Y(R)-1
185 IFY>Y(R)THENY(R)=Y(R)+1
190 POKEC+4,16:IFX(R)=XANDY(R)=YTHENGOTO3
    25
195 IFPEEK(FNP(R))=42THENI=R:GOTO290
200 GOTO105
205 B=X:D=Y
210 IFJ0=0ANDJ1=0ANDJ2=0ANDJ3=0THEN155
215 GOTO225
220 POKE1024+B+40*D,32
225 IFJ0=1THENB=B+1
230 IFJ1=1THEND=D+1
235 IFJ2=1THENB=B-1
240 IFJ3=1THEND=D-1
245 IFPEEK(1024+B+40*D)>35THEN260
250 POKE1024+B+40*D,35:POKE55296+B+40*D,1
    5
255 FORO=1TO2:NEXT:GOTO220
260 P=1024+B+40*D:P1=PEEK(P)
265 IFP1>37THEN155
270 FORO=250TO210STEP-3:POKEC+1,O:POKEC+4
    ,129:POKEP,RND(1)*255:NEXT:POKEC+4,16
275 IFP1=37THENPOKEP,32:GOTO155
280 POKEP,32:FORI=1TO3:IFX(I)=BANDY(I)=DT
    HEN290
285 NEXT:GOTO155
290 X(I)=INT(RND(1)*36)+3:Y(I)=INT(RND(1)
    *19)+3
295 SC=SC+10:IFSC=200ORSC=800THENGOSUB415
300 GOSUB430:FORO=1TO400:NEXT:POKEFNP(I),
    36:POKEFNP(I)+C,13
305 FORO=250TO140STEP-8:POKEC+1,O:POKEC+4
    ,17:NEXT:POKEC+4,16
310 SL=SL-.2:IFSL<1THENSL=1
315 S1=S1-.2:IFS1<2THENS1=2
320 GOTO155
325 MN=MN-1:GOSUB430:POKEC+1,100:POKEC+4,
    129
330 FORQ1=1TO16:POKEFNQ(0)+C,1+RND(1)*8
335 NEXT:POKEC+4,128
340 POKEC+4,16:POKEFNQ(0),32
345 S2=S2-5
350 IFMN>0THEN45
360 PRINT"{HOME}{13}";:FORI=1TO24:PRINT"
    ************************************
    ***";:NEXT
362 FORI=1984TO2023:POKEI,42
365 POKEI+C,8:NEXT
```



64 version of "Colorbot."

```
370 POKE53280,6:PRINT"{WHT}{HOME}{8 DOWN}
    {16 RIGHT}{RVS}GAME{2 SPACES}OVER"
372 PRINT"{WHT}{HOME}{8 DOWN}{16 RIGHT}
    {RVS}GAME{2 SPACES}OVER"
375 PRINT"{4 DOWN}{12 RIGHT}{RVS}PLAY AGA
    IN{SHIFT-SPACE}(Y/N){SHIFT-SPACE}?"
380 FORQ1=128TO254:POKEC+1,Q1:POKEC+4,17:
    NEXT:POKEC+4,16
390 GETA$:IFA$<>"Y"ANDA$<>"N"THEN390
395 IFA$="Y"THENCLR:PRINT"{CLR}":GOTO4
400 POKE53272,21:POKE53270,PEEK(53270)AND
    239
410 POKE53280,14:POKE53281,6:PRINT"{CLR}
    {7}";:END
415 MN=MN+1:SC=SC+100:GOSUB430
420 RETURN
430 SC$=STR$(SC):MN$=STR$(MN)
433 PRINT"{HOME}{YEL}{RVS} SCORE:{CYN}";S
    C$;" {YEL}MEN:{PUR}";MN$;"
    {SHIFT-SPACE}{OFF}";
435 RETURN
440 PQ=PEEK(56320):P=PQAND15:P1=PQAND16
441 J0=-((P=7)OR(P=6)OR(P=5)):J1=-((P=13)
    OR(P=5)OR(P=9))
445 J2=-((P=11)OR(P=9)OR(P=10)):J3=-((P=1
    4)OR(P=10)OR(P=6)):F=-(P1=0):RETURN
450 X1=X1+1:IFX1>34THENX1=33
455 Z1=Z1+1:IFZ1>4THENZ1=1
460 POKEC+1,Z(Z1):POKEC+4,17
465 IFPEEK(FNQ(0))>34THENH=1
470 POKEFNQ(0),X1:POKEFNQ(0)+C,1:RETURN
475 POKEFNQ(0),32:X=X+1:IFX>38THENX=X-1:H
    =1
480 RETURN
485 POKEFNQ(0),32:Y=Y+1:IFY>23THENY=Y-1:H
    =1
490 RETURN
495 POKEFNQ(0),32:X=X-1:IFX<1THENX=X+1:H=
    1
500 RETURN
505 POKEFNQ(0),32:Y=Y-1:IFY<2THENY=Y+1:H=
    1
510 RETURN
1000 POKE56334,PEEK(56334)AND254:POKE1,PE
     EK(1)AND251
1010 FORI=12288TO12288+256*8:POKEI,PEEK(I
     +40960):NEXTI
```

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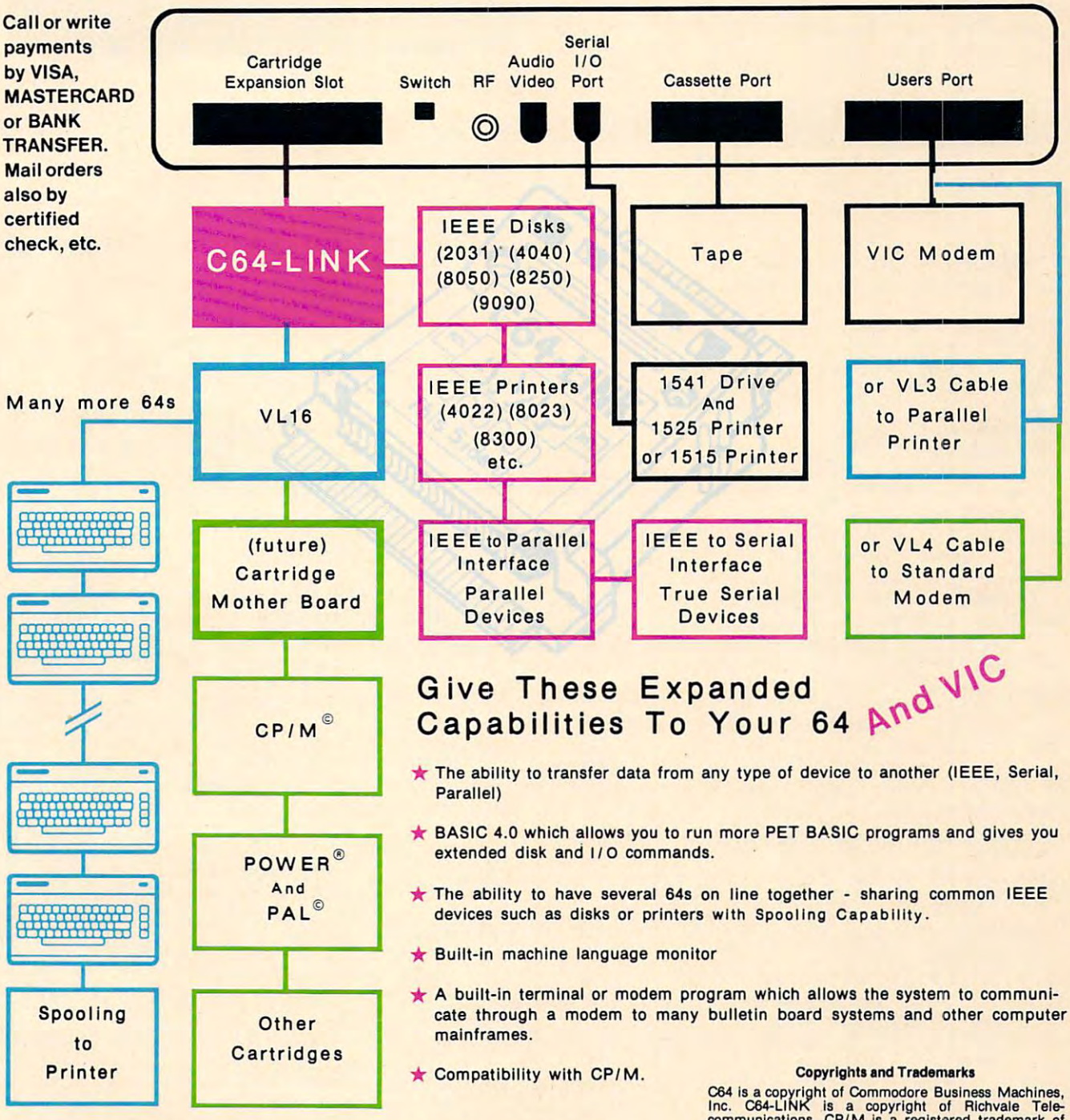

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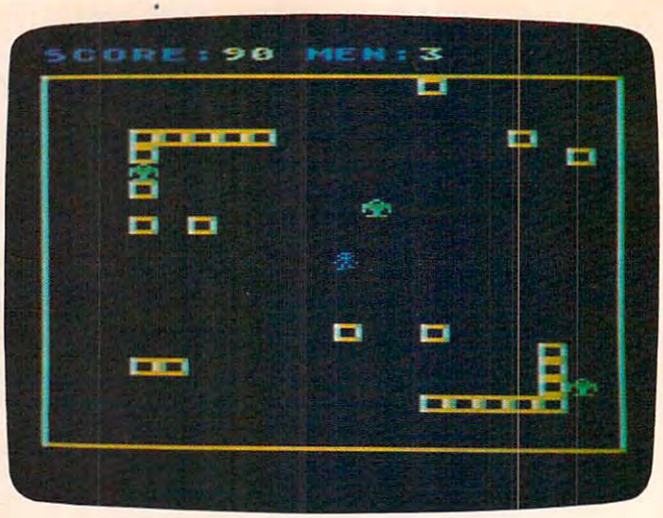
```
1020 FORI=12288+32*8TO12288+150+32*8:READ
     X:POKEI,X:NEXTI
1030 POKE1,(PEEK(1)OR4):POKE56334,(PEEK(5
     6334)OR1)
1040 POKE53272,(PEEK(53272)AND240)+12
1045 POKE53270,PEEK(53270)OR16
1050 RETURN
2000 DATA0,0,0,0,0,0,0,0
2010 DATA56,84,56,84,146,40,104,12
2020 DATA56,84,56,84,146,40,44,96
2030 DATA0,0,32,184,32,0,0,0
2040 DATA4,8,63,63,46,38,4,21
2050 DATA0,0,48,48,0,0,0,0
2060 DATA0,0,0,0,0,255,255,170
2070 DATA224,224,224,224,224,224,224,224
2080 DATA11,11,11,11,11,11,11,11
2090 DATA170,255,255,0,0,0,0,0
2100 DATA170,170,190,190,190,190,170,170
2110 DATA141,0,192,238,2,192,173,2
2120 DATA192,201,255,208,6,173,0,192
2130 DATA76,49,234,238,1,192,173,1
2140 DATA192,201,5,208,240,169,0,141
2160 DATA1,192,24,173,35,208,105,1
2170 DATA141,35,208,76,101,49,14,144
2180 DATA201,224,48,5,169,15,141,14
2190 DATA144,174,252,29,76,104,29
```

Program 4: Atari Colorbot

Translation by Kevin Martin, Editorial Programmer

```
2 COLOR 1
3 OPEN #1,4,0,"K:"
5 DIM X(3),Y(3),Z(4),A$(1)
10 GOSUB 1000
20 SCRN=PEEK(88)+256*PEEK(89)
30 FOR I=1 TO 3
35 A=0:X1=129:SL=10:S1=5:S2=15:MN=4
45 FOR I=SCRN TO SCRN+479:POKE I,0:N
   EXT I:FOR I=1 TO S2:R=SCRN+40+RND
   (1)*360:POKE R,10
50 SOUND 1,RND(1)*50+100,10,15:NEXT
   I:SOUND 1,0,0,0
55 FOR I=SCRN+20 TO SCRN+39:POKE I,6
   :POKE I+440,9:NEXT I
60 FOR I=SCRN+40 TO SCRN+440 STEP 20
   :POKE I,7:POKE I+19,8:NEXT I
65 FOR I=SCRN+103 TO SCRN+107:POKE I
   ,10:POKE I+310,10:NEXT I
70 FOR I=SCRN+123 TO SCRN+163 STEP 2
   0:POKE I,10:POKE I+234,10:NEXT I
80 H=0:X=10:Y=12
85 FOR I=1 TO 3:X(I)=INT(RND(1)*16)+
   3:Y(I)=INT(RND(1)*20)+3:NEXT I
90 GOSUB 430
95 FOR I=1 TO 3:GOSUB 550:POKE P,68:
   NEXT I
100 GOSUB 560:POKE Q,X1:Z1=1
105 FOR I=1 TO 3:GOSUB 550:POKE P,68
    :NEXT I
110 GOSUB 560:POKE Q,X1
115 GOSUB 440
120 IF STRIG(0)=0 THEN 205
125 IF QQ=7 OR QQ=6 OR QQ=5 THEN GOS
    UB 475:GOSUB 450
130 IF QQ=13 OR QQ=5 OR QQ=9 THEN GO
    SUB 485:GOSUB 450
135 IF QQ=11 OR QQ=9 OR QQ=10 THEN G
    OSUB 495:GOSUB 450
140 IF QQ=14 OR QQ=10 OR QQ=6 THEN G
    OSUB 505:GOSUB 450
```



Atari version of "Colorbot."

```
145 SOUND 1,0,0,0
150 IF H=1 THEN 325
155 R=INT(RND(1)*SL)+1:IF R>3 THEN 1
    05
160 GOSUB 570:POKE P,0:SOUND 1,RND(1
    )*50+100,10,15
165 IF INT(RND(1)*S1)=1 THEN GOSUB 5
    50:POKE P,197
170 IF X<X(R) THEN X(R)=X(R)-1
175 IF X>X(R) THEN X(R)=X(R)+1
180 IF Y<Y(R) THEN Y(R)=Y(R)-1
185 IF Y>Y(R) THEN Y(R)=Y(R)+1
190 SOUND 1,0,0,0:IF (X(R)=X) AND (Y
    (R)=Y) THEN 325
195 GOSUB 570:IF PEEK(P)=10 THEN I=R
    :GOTO 290
200 GOTO 105
205 B=X:D=Y
207 QQ=STICK(0)
210 IF QQ=15 THEN 155
215 GOTO 225
220 POKE SCRN+B+20*D,0
225 IF QQ=7 OR QQ=6 OR QQ=5 THEN B=B
    +1
230 IF QQ=13 OR QQ=5 OR QQ=9 THEN D=
    D+1
235 IF QQ=11 OR QQ=9 OR QQ=10 THEN B
    =B-1
240 IF QQ=14 OR QQ=10 OR QQ=6 THEN D
    =D-1
245 IF PEEK(SCRN+B+20*D)>3 THEN 260
250 POKE SCRN+B+20*D,3
255 GOTO 220
260 P=SCRN+B+20*D:P1=PEEK(P)
265 IF P1<>197 AND P1<>68 THEN 155
270 SOUND 1,RND(1)*100+100,0,15
275 IF P1=197 THEN POKE P,0:GOTO 155
280 POKE P,0:FOR I=1 TO 3:IF (X(I)=B
    ) AND (Y(I)=D) THEN 290
285 NEXT I:GOTO 155
290 X(I)=INT(RND(1)*16)+3:Y(I)=INT(R
    ND(1)*20)+3
295 SC=SC+10:IF (SC=200) OR (SC=800)
     THEN GOSUB 415
300 GOSUB 430:FOR O=1 TO 400:NEXT O:
    GOSUB 550:POKE P,68
305 FOR O=250 TO 140 STEP -8:SOUND 1
    ,O,10,15:NEXT O:SOUND 1,0,0,0
```

```
310 SL=SL-Ø.2:IF SL<1 THEN SL=1
315 S1=S1-Ø.2:IF S1<2 THEN S1=2
320 GOTO 155
325 MN=MN-1:GOSUB 430
330 FOR I=50 TO 100 STEP 5:SOUND 1,I
    ,10,15:GOSUB 560:POKE Q,RND(1)*2
    55
335 NEXT I
340 SOUND 1,Ø,Ø,Ø:GOSUB 550:POKE P,Ø
345 S2=S2-5
350 IF MN<>Ø THEN 45
360 FOR Q2=SCRN TO SCRN+479:POKE Q2,
    138:NEXT Q2
370 POSITION 5,8:? #6;"GAME  OVER"
375 POSITION 1,16:? #6;"PLAY AGAIN [
    Y/N] ?"
390 GET #1,A:A$=CHR$(A):IF (A$<>"Y")
     AND (A$<>"N") THEN 390
395 IF A$="Y" THEN RUN
400 POKE 106,PEEK(106)+5:GRAPHICS Ø:
    END
415 MN=MN+1:SC=SC+100:GOSUB 430
420 RETURN
430 POSITION Ø,Ø:? #6;"SCORE:";SC;"
    MEN:";MN;" ";
440 QQ=STICK(Ø):POKE 708,PEEK(53770)
    :RETURN
450 X1=X1+1:IF X1>130 THEN X1=129
455 Z1=Z1+1:IF Z1>4 THEN Z1=4
460 SOUND 1,50*RND(1)+100,10,15
465 GOSUB 560:IF PEEK(Q)>2 THEN H=1
470 GOSUB 560:POKE Q,X1:RETURN
475 GOSUB 560:POKE Q,Ø:X=X+1:IF X>19
     THEN X=19:H=1
480 RETURN
485 GOSUB 560:POKE Q,Ø:Y=Y+1:IF Y>22
     THEN Y=22:H=1
490 RETURN
495 GOSUB 560:POKE Q,Ø:X=X-1:IF X<1
    THEN X=1:H=1
500 RETURN
505 GOSUB 560:POKE Q,Ø:Y=Y-1:IF Y<2
    THEN Y=2:H=1
510 RETURN
550 IF I<4 THEN P=SCRN+X(I)+20*Y(I):
    RETURN
555 RETURN
560 Q=SCRN+X+20*Y:RETURN
570 IF R<4 THEN P=SCRN+X(R)+20*Y(R):
    RETURN
575 RETURN
1000 IF PEEK(106)=155 THEN CHSET=(PE
     EK(106)+1)*256:GRAPHICS 17:POKE
      756,CHSET/256:RETURN
1005 POKE 106,PEEK(106)-5:GRAPHICS 1
     7
1007 POSITION 5,5:? #6;"redefining"
1008 POSITION 5,10:? #6;"CHARACTERS"
1009 POSITION 4,15:? #6;"PLEASE  WAI
     T"
1010 CHSET=(PEEK(106)+1)*256
1015 POKE 756,CHSET/256
1020 FOR X=Ø TO 1023:POKE CHSET+X,PE
     EK(57344+X):NEXT X
1030 FOR I=8 TO 87:READ X:POKE CHSET
     +I,X:NEXT I
1040 RETURN
2000 DATA 56,84,56,84,146,40,44,96
2010 DATA 56,84,56,84,146,40,104,12
2020 DATA Ø,Ø,Ø,24,102,24,Ø,Ø
2030 DATA 24,36,255,255,189,153,24,1
     26
2040 DATA Ø,Ø,Ø,24,24,Ø,Ø,Ø
2050 DATA Ø,Ø,Ø,Ø,Ø,Ø,255,255
2060 DATA 192,192,192,192,192,192,19
     2,192
2070 DATA 3,3,3,3,3,3,3,3
2080 DATA 255,255,Ø,Ø,Ø,Ø,Ø,Ø
2090 DATA 255,255,195,195,195,195,25
     5,255
```

©

The Robot Teddy Bear

Just about this time last year my three-year-old son, Eric, and I went to the World Science Fiction Convention in Chicago. It was an experience neither of us will ever forget.

The hotel where the convention took place was filled with over 7,000 science fiction movie makers, writers, hucksters, and fans. Most of the fans were in costume.

Since the fans were in costume, Eric and I decided to wear costumes, too. We went with three friends we were staying with in Chicago. Hope (8 years old) dressed as a bride, Felicity (10) as a princess, Hugh (6) as an Indian, Eric was the Lone Ranger, and I went in the most bizarre costume of all—a business suit with a narrow tie, dark shoes, and a briefcase.

The kids' costumes fit right in, but my costume got a lot of surprised and baffled stares. Each time someone stared at me in wonder, I secretly patted myself on the back for my originality.

You Will Always Be In My Memory Bank

Eric and I returned to the convention on another day by ourselves. That's when Eric met Denby, a show robot from the International Robotics Corporation in Dearborn, Michigan. Denby was about six feet tall and all white except for a "billboard" advertisement on the front of his cylindrical body that advertised two of the leading science fiction magazines.

Denby was a real character. When he spotted Eric, he rolled over and greeted him. "What's your name, young man?" he asked.

Eric told him his name. He also told Denby about his mother, his sister, and his black cat, Mowie. He told Denby he had seen Darth Vader and Yoda at the convention, and that he had worn his Lone Ranger outfit last time he was there.

Denby told Eric that he was the nicest little boy he had seen at the entire convention.

Eric shook Denby's hand and gave him a big hug. Denby got so excited he started bouncing around the floor, spinning his head, and blinking his baby-blue eyes. "Whooweee!" he said.

Denby told Eric good-bye and rolled off across the convention floor. That didn't shake Eric. He followed Denby around the convention, up an elevator, and into a conference room. He didn't miss an opportunity to engage Denby in further conversation, shake his "gripper" hand, and give him kisses and hugs. (Eric couldn't reach more than a third of the way around Denby's barrel waist, so he hugged Denby's leg.)

Denby was a nice robot. Every time Eric appeared he acted really happy to see him. I think he must have realized that he had stolen Eric's heart.

Eric finally said good-bye to Denby, but not before he had collected a Polaroid photo of himself and Denby in front of the *OMNI* magazine booth, and another 8 × 10 color photo of Denby, complete with Denby's personalized autograph. On the photo Denby wrote: "To Eric, You will always be in my memory bank."

Now, a year later, the photos are still among Eric's prized possessions. One hangs on his bedroom wall; the other sits on his dresser and often gets taken to bed.

Eric Meets Little Denby

Big Denby made such an impression on Eric that when I saw a little toy robot at one of the booths at the convention, I immediately picked it up.

The new robot became known as "Little Denby," then simply as "Denby."

From the first night he got him, Eric began taking Denby to bed with him, like a mechanical teddy bear.

Denby does not look like a teddy bear. He

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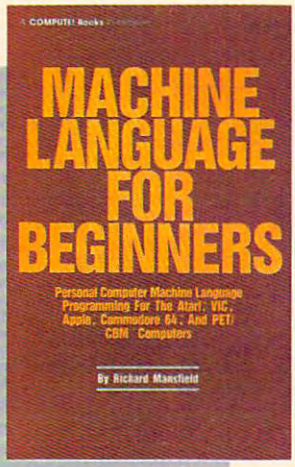

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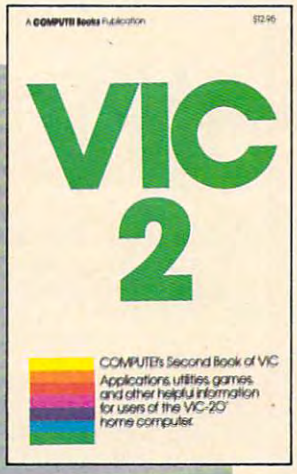

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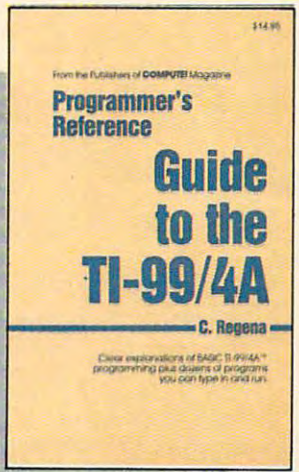

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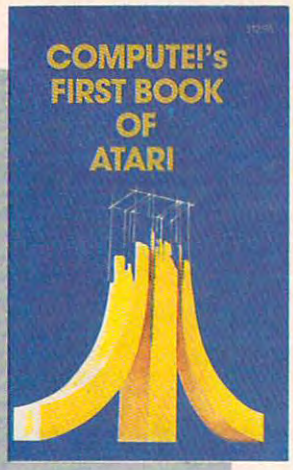

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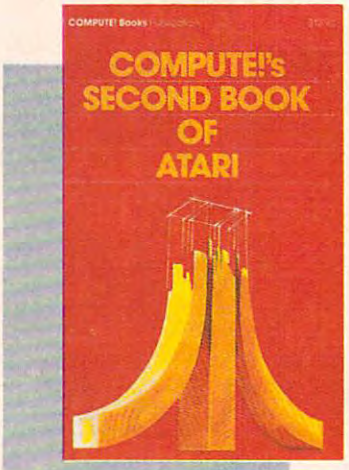

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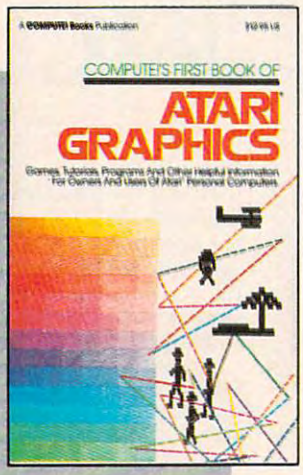

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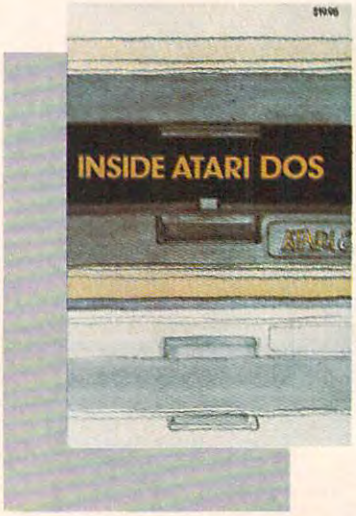

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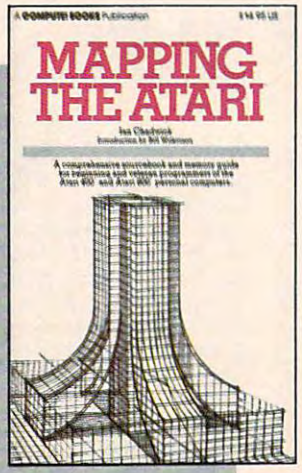

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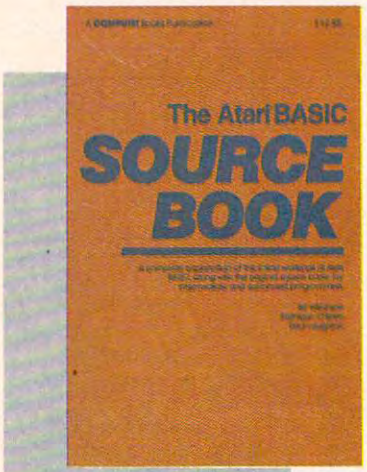

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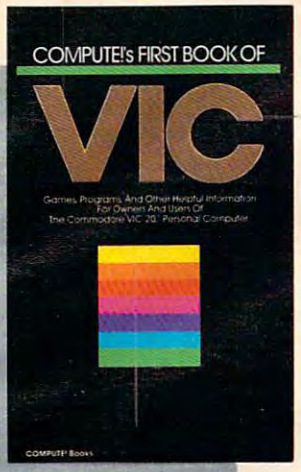

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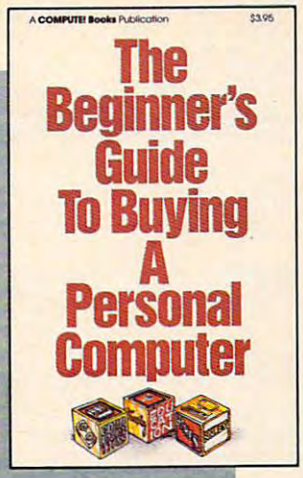

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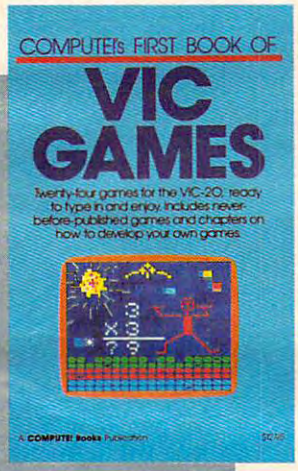

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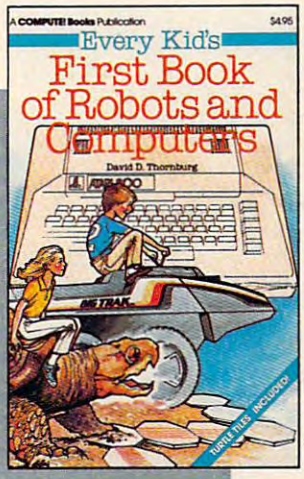

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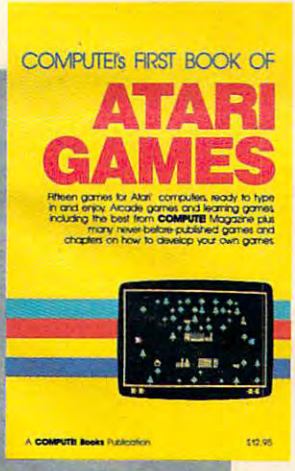

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