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COMPUTE!

$2.95
March
1984
Issue 46
Vol. 6, No. 3
£2.25 UK $3.25 Canada
02193
ISSN 0194-347X

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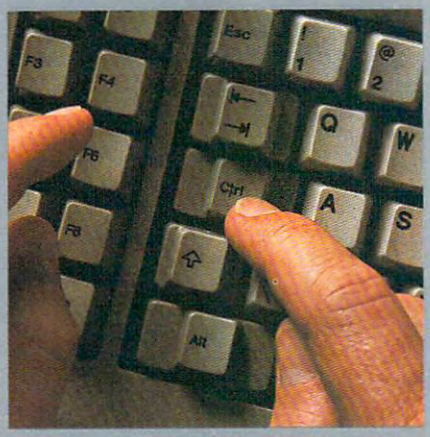

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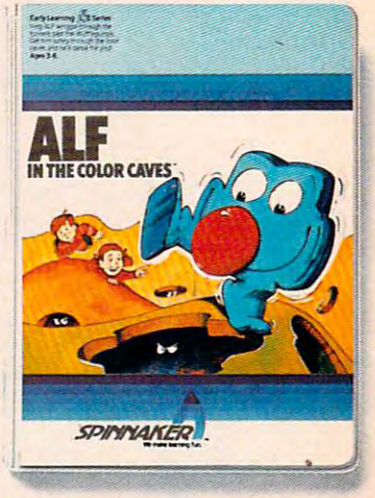

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March 1984 Vol. 6, No. 3

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THE JOURNAL

NOTE: See page 180 before typing in programs.

AP Apple **AT** Atari, **P** PET/CBM, **V** VIC-20, **C** Radio Shack Color Computer, **64** Commodore 64, **TS** Timex/Sinclair, **TI** Texas Instruments, **PCjr** IBM PCjr, **PC** IBM PC, **AD** Coleco Adam, *All or several of the above.

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COMPUTE! The Journal for Progressive Computing (USPS: 537250) is published monthly by COMPUTE! Publications, Inc., P.O. Box 5406, Greensboro, NC 27403 USA. Phone: (919) 275-9809. Editorial Offices are located at 324 West Wendover Avenue, Greensboro, NC 27408. Domestic Subscriptions: 12 issues, $24. Send subscription orders or change of address (P.O. form 3579) to **COMPUTE!** Magazine, P.O. Box 914, Farmingdale, NY 11737. Second class postage paid at Greensboro, NC 27403 and additional mailing offices.

ISSN 0194-357X.

EDITOR'S NOTES

In a surprise announcement, Commodore President and Chief Executive Officer Jack Tramiel resigned on Friday, January 13. Tramiel's reported replacement, Marshall F. Smith, is expected to assume his duties in late February. Smith is currently president and chief executive officer of the U.S. unit of a Netherlands-based company, Thyssen-Bornemisza. To Commodore, Smith brings a track record of experience in major manufacturing operations and finance. His U.S. operation had 1982 sales approaching $1 billion. Smith does not have computer industry experience—it had been anticipated that Commodore Chairman Irving Gould would stress other variables in his selection.

The end of an era? Tramiel's resignation was met with surprise and some consternation within Commodore. His direct, aggressive style has been a critical factor in driving Commodore to its position of preeminence in the low-priced personal computer market. Tramiel was quoted as saying the company needed a "professional executive" to head it, given that the company has now reached the billion dollar sales mark.

What price stability? Commodore has had a series of senior management turnovers during the years of its growth as a personal computer manufacturer. All have been subordinate to Tramiel, and most who were brought in at the level of president had short-lived tenures. Tramiel's aggressive, active intervention in most facets of the company's operations and planning caused some internal conflict, visible externally in the high turnover.

Growth of the sort that Commodore has experienced can be damaging to a poorly run company, yet Commodore weathered its growth well, given that its annualized sales have increased by a factor of roughly 25 times in the last six or seven years. At the same time, Commodore has experienced some hardware problems, the most recent example centering around last fall's delays and disputed defects in the company's 1541 disk drive. Mr. Smith will bring to this situation experience in multisite manufacturing operations, and seasoned talent as the head of a company of roughly comparable revenues.

Tramiel, perhaps not considering himself a "professional executive," did run the company with a ruthless understanding of the marketplace. The year of the computer (1983) in many ways became the year of Commodore in the low-end market, as Tramiel's aggressive product introduction and pricing forced Texas Instruments out of the market and, at least temporarily, damaged Atari's position.

While we can now anticipate more internal stability at Commodore, and perhaps streamlined manufacturing operations, our concern will be the impact of Tramiel's absence on the company's aggressive stance. We've already heard rumors of a push to increase prices. Depending on the extent of such increases, Commodore might well find itself moving away from a market it opened up, and eventually trading market share to competition from overseas. Time will, of course, tell. We wish Mr. Tramiel well, and thanks for those 25 years of Commodore. And we welcome Mr. Smith, who's taking on a two-fisted job.

Robert Lock
Editor In Chief

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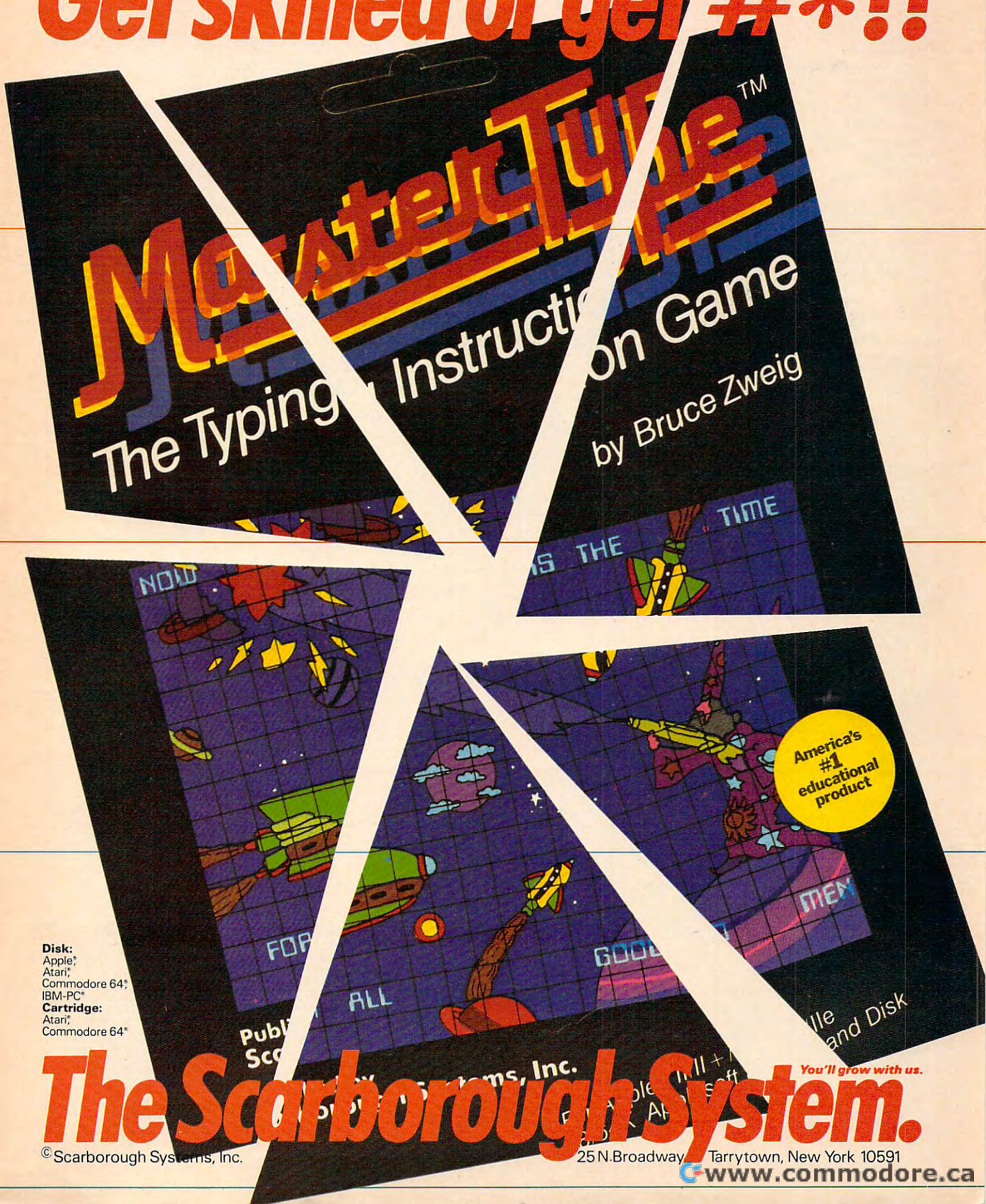

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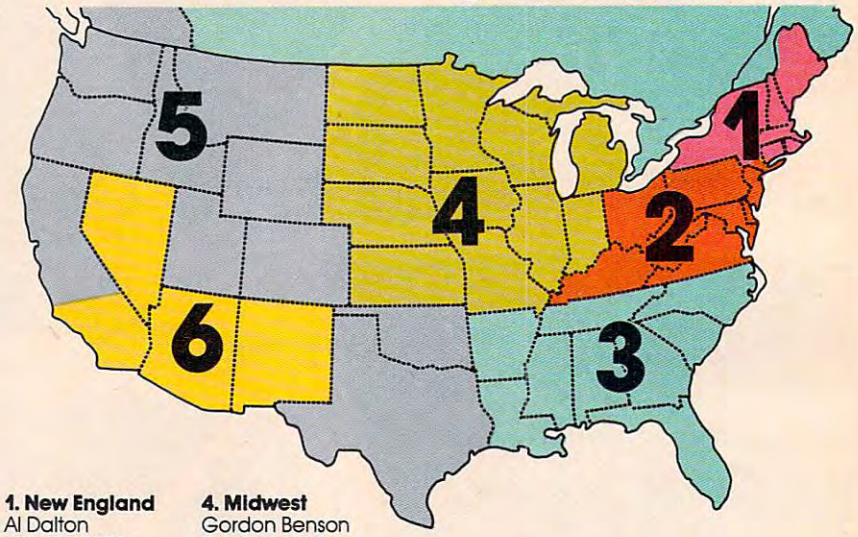

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READERS' FEEDBACK

The Editors and Readers of COMPUTE!

Can Your Computer Tattoo A TV?

I am considering purchasing a VIC or 64, and I plan to use the family TV with the computer. Do the images from a computer damage a TV by leaving imprints on the screen?

Timothy J. Prusinski

The problem you are describing is known as image burn-in. *It usually affects a video unit on which the same message is displayed continuously in the same place on the screen. This practice causes uneven wear in the screen's phosphor coating, which eventually results in the message being visible on the screen even when the unit is turned off. Using your TV with a computer will not cause image burn-in, unless you leave your computer on and continually display the same pattern on your TV for a very long time—several days, at least.*

Easy Memory For The 64?

I recently purchased a 64, and discovered that only about 38K of BASIC RAM are available for my use. I have found a POKE that increases it by 5888 bytes. After turning your 64 off, then on, try the following:

```
PRINT FRE(0)
POKE 56, 137
PRINT FRE(0)
```

After entering these commands in the direct mode, the first result was –26627. After the POKE, the result was –32515, a difference of 5888 bytes.

My question is, why does it do this? Does it have any harmful side effects?

Jeff Lewis

The memory location you POKEd (byte 56) is one of two bytes (55 and 56) that tell the operating system the highest address used by BASIC.

*As you discovered, these locations can be POKEd with new values. By POKEing location 56, you told the 64's operating system that the top of BASIC memory had been changed. The normal values for 55 and 56 are 0 and 160 respectively, signaling that the top of BASIC memory is 40960 (0+256*160). If you POKEd a value* higher *than 160 into location 56, you would be telling the computer it has more memory than it actually does.*

When you POKEd 56 with a value of 137, you actually lowered *the top of BASIC memory, which decreased the amount of RAM available for use. This is a legal POKE, and might be used, for example, if you wanted to protect a machine language program in high memory.*

This won't damage your computer. To reset the pointers to normal, simply turn your 64 off, then back on. However, POKEing values into the memory pointers can cause strange RUNs if you're using a BASIC program.

TI-99/4A And COMPUTE!

I would like to know if you will still be writing games and other programs for the TI-99/4A, even though Texas Instruments has discontinued production.

Curtis Tsui

We'll continue to support the TI-99/4A.

Mysterious Commodore SYS

Our users group, Richmond Area Commodore Enthusiasts, would like to find out all about the SYStem commands. We know that SYS 64802 will cold start the VIC. Is there any publication, book, or article that has a list of all the SYS commands? Our computer manuals give the definition of the SYS command, but other than a few examples, offers nothing further.

E. M. Rexrode

The SYS command is used to transfer control from a BASIC program to a machine language program. The format for the SYS command is SYS NNNNN, *where* NNNNN *is any memory location. The computer will start executing the machine language at the address specified by NNNNN.*

SYS is user-controlled. That is, in the VIC and the 64, you can SYS to any memory location between 1 and 65535. The memory location can be the start of a machine language program in user RAM, or an ML routine within BASIC or Kernal ROM. The SYS command is not a prewritten package of routines.

There is only one SYS command, but it can access many routines within the computer (such as "cold start," which simulates turning the computer on). To learn these addresses you need a map of your computer's memory. These maps are found in various COMPUTE! Books such as COMPUTE!'s First Book of VIC,

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Atari Background Music

I recently bought an Atari 1010 program recorder. I have several Atari programs that play music while loading. I was wondering if it is possible to do this to my own programs.

Chris Seay

The Atari cassette system is based on two-track stereo. One track is used to record programs and data by means of audio tones (one frequency for 1, another for 0). The other track can be used to record and play back normal audio. You need to do your recording on another cassette recorder, as there is no provision for the 1010 (or 410) recorder to accept a microphone.

You can turn on or off the cassette motor from a BASIC program with two POKEs: POKE 54018,52 to turn the motor on, and POKE 54018,60 to turn the motor off. When the motor is on, any sound on the audio track will begin to play through the TV speaker. You can use timing loops to synchronize your program with the recorded sound.

The audio track can also be heard during tape operations such as CLOAD, but will be mixed with the normal tones you hear during CLOAD. Use POKE 65,0 to turn off the sound of the data track. You will need to use a stereo cassette recorder to mix programs and sound on the same segment of tape.

You can find more information in COMPUTE!'s First Book of Atari*: "Adding a Voice Track to Atari Programs."*

A Disk Disaster

I own a VIC and a 1541 disk drive. In the three years I've had them, I've written and saved many programs on a certain disk. But now the disk won't give me access to all my programs. When I ask for the directory, it gives me either the first half of it, or just garbage. Then I get the message 23 READ ERROR 1807.

I think I've found the problem. There's a scratch about a centimeter long in the middle of the disk. How can I get to the programs beyond the scratch? Is there any way to fix my disk or make it work more than it does now?

Mike DiPiero

Since you are getting a READ ERROR when you access the directory, the scratched area probably includes some sectors of track 18, where the directory is stored. The LOAD command uses the directory to locate files on the disk; if the directory information for a file is destroyed, the file cannot be LOADed.

There is no way to fix your disk, because the scratch has destroyed the magnetic coating as well as the information that was stored on it. To make the best of a bad situation, format a new disk, and transfer to it any programs which will still LOAD from your damaged disk. Also, to avoid a similar disaster in the future, it's a good idea to make a backup copy of your salvaged programs, because floppy disks do not last forever. Even if used infrequently in an absolutely dust-free, cool environment, a disk will eventually wear out. When that happens, you will have all your programs intact and safe on your backup copy. And before you press your backup into service, make another backup disk, in case of accidents.

More On 64 Video Cable

I own a 64 and recently purchased the 1702 monitor. However, to my chagrin, I soon discovered that the 8-pin cable packed with the monitor is not compatible with my 64, which has a 5-pin video output.

In COMPUTE!, November 1983, Jim Butterfield wrote an article on how to improve the 64's video quality. He said that a 5-pin cable is available to access the 1702's rear three inputs. Where can I buy this cable?

Steve M. Walsh

Any store with a good supply of video or electronics parts should have the cable you want. Be sure the cable has a 5-pin DIN connector on one end, and at least three RCA connectors on the other end.

A Fifth Voice For Atari

I have had an Atari 800 for quite a while now, and love it. Also, being a musician, I like working with the Atari sounds and *Music Composer*. One thing that intrigues me is the Apple's ability to produce sounds through its internal speaker. Even though I have no need for this on the Atari, I want to know if this is possible, perhaps to produce a fifth voice, or even stereophonic sound.

Freddie Scudiero

The internal speaker on the Atari 400 and 800 can be programmed in much the same way as the Apple. If you POKE 53279 with a 0, the internal speaker will emit a small click. The operating system turns off the speaker within 1/60 second, during the periodic vertical blank. Every time you POKE 53279,0 to pop out the speaker, the OS (operating system) pops it back in.

If you disable the vertical blank, you can push or pop the speaker at your own rate. Machine language is required to click the speaker fast enough to generate tones. An article and program to use the internal speaker as a "fifth voice" can be found in COMPUTE!'s Second Book of Atari*: "The Atari Keyboard Speaks Out."*

Incidentally, the new XL computers do not have an internal speaker. All access to location 54018 is routed to the TV or monitor speaker.

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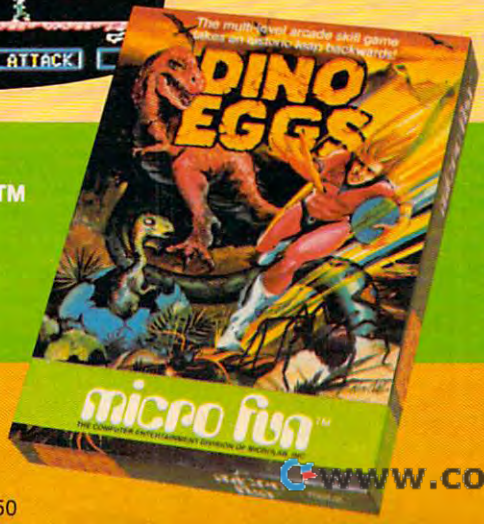

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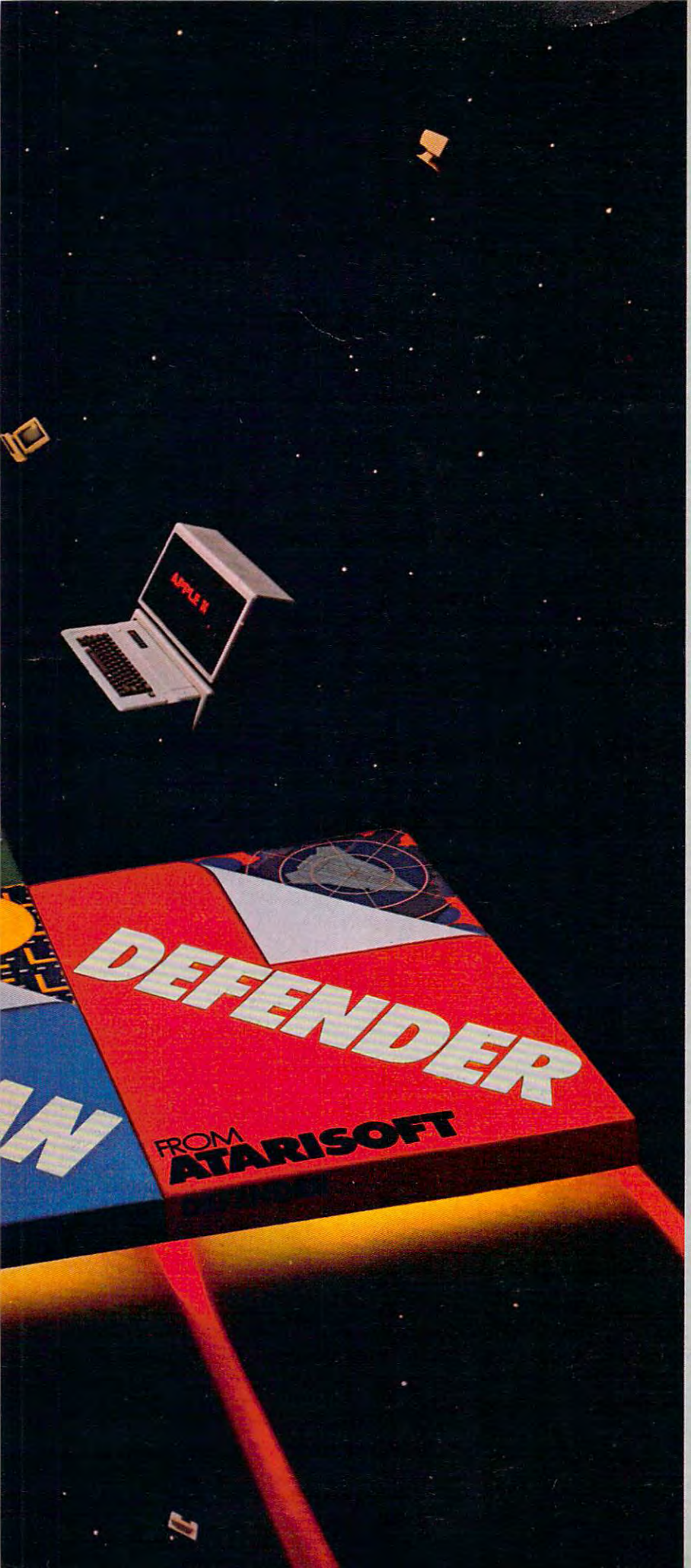

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Taking Your Computer Abroad

I am the owner of a Commodore 64 computer and a 1541 disk drive. Being in the military, and changing duty stations often, I need to know how to change the frequency of the internal timer from 60 hertz to 50 hertz while using a step-down transformer to reduce voltage from 220 to 110 volts. The *Commodore 64 Programmer's Reference Guide* touches upon this, but doesn't go into any detail. I believe this is done with a POKE, but I'm not entirely sure what to change. You're my last hope; can you help?

Louis D. Steinritz

We've received many inquiries lately about European computing. To change the North American model of the 64 to successfully operate in Europe, the VIC-II chip and a crystal have to be changed from the standard 60 hertz model to one that operates at 50 hertz. Unfortunately, the 50 hertz VIC-II chip is not for sale to the public. However, there is another way to use your U.S. model 64 in Europe. If you take an American monitor with you, you should have no problems. As long as the 64 and the monitor are compatible, the change from 50 to 60 hertz shouldn't affect performance.

For VIC-20 owners, however, the VIC chip is available in the 50 hertz version, so conversion should be simple. For more information, contact your local Commodore service representative.

Atari Cassette LOADs

I am very eager to expand my Atari 400 computer from 16K to 48K. But, I've heard rumors that doing this sometimes messes up the cassette buffer, causing the 410 recorder only to load 50 percent of the time. Is this rumor true? Is there any other way the expansion changes the computer and its memory?

Mike Cohen

We've never heard that rumor, and can't see how it could be true. Unless the upgrade was improperly engineered so as to cause timing problems, it should merely add more memory. The cassette buffer is located in the lower 16K of memory anyway. However, there is a problem with SYSTEM RESET. Pressing SYSTEM RESET can sometimes leave the cassette improperly initialized. Atari recommends that you issue a LPRINT command (with or without a printer) before you try to CSAVE a program.

Synthesizer Check Routine For TI "Crazy Climber"

Here is a neat trick to use on TI computer programs (Extended BASIC only) that have CALL SAY statements. (See "Crazy Climber" for the TI-99/4A, COMPUTE!, November 1983.) If there is no speech synthesizer attached, the program stops at line 320 with an error message, because the computer can't talk without its talker.

COMPUTE! puts in a REM about removing the CALL SAY if no synthesizer is attached, but there is an easier way. Edit lines 110 and 320 to read:

```
110 CALL PEEK(-28672,SP)::GOTO 140
320 T=1::V=2::CALL DELSPRITE(#1)::
IF SP=96 THEN CALL SAY ("UHOH")
```

Here's how it works:

In the TI editor/assembler manual, page 354, there is a way to check to see if the synthesizer is attached or not. Without going into machine language (which I don't understand that well), it boils down to CALL PEEK(–28672,SP). This PEEK should be placed ahead of any CALL SAY statement and need be executed only once.

When the program runs, the PEEK looks to see if the synthesizer is attached. It sets the variable SP to 0 if not attached, and 96 if attached.

Try this two-liner:

```
100 CALL PEEK(-28672,@)::CALL CLEAR
110 IF @ THEN CALL SAY("HELLO,HOW AR
    E YOU")ELSE DISPLAY AT(12,3):"NO
     SYNTHESIZER ATTACHED."
```

No, I didn't goof by using the @ for a variable name— it is valid.

After running the above, you will get the message one way or another. Try it with and without the synthesizer.

Caution: Do not attach or remove the synthesizer with your console power on. Lockup will occur, and you will have to turn the console power off, then on again, to recover.

Jim Pate

Thank you for the suggestion.

Speakers With Monitors

I understand that an unshielded speaker's magnets will cause problems with a video monitor. But rather than buy an expensive shielded speaker, I prefer to buy an inexpensive, bookshelf speaker for the audio output from my 64. Can you tell me what is considered a safe distance to place a small speaker from a monitor?

Russell Baksic

The speaker will probably not affect your monitor unless you place it directly above or beside the monitor.

Smooth Scroll On The 64

I own a 64 and do a lot of programming in BASIC. I know that this computer is able to perform a smooth scroll in four directions. After consulting my *Programmer's Reference Guide* and several COM-

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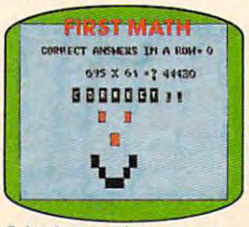

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PUTE! articles, I figured out how to do this, but only seven pixels each way. Only when I was scrolling up was I able to scroll more than seven pixels. There is a noticeable flicker when going from the seventh pixel to the first. Is there a way to get a truly smooth scroll?

Andrew Werth

Because BASIC is relatively slow, you will always have a flicker when you scroll from one character to the next. To achieve a truly smooth scroll, you need to write a routine in machine language, which is far faster than BASIC.

64 Tape LOADs With Supermon

I have one of the many versions of Supermon64 (COMPUTE!, January 1983), which I have been running on my Commodore 64. I have used it successfully to assemble and run some simple machine language subroutines to move sprites.

My problem is, I cannot successfully save a BASIC program that includes these subroutines.

According to my *Programmer's Reference Guide*, I should be able to load the machine language routines from within the BASIC program by using LOAD "Machine Language Name",1,1. When I try this, it says PRESS PLAY, stops at the proper place, and says FOUND Machine Language Name. However, when I press the Commodore key, it won't load properly. It will run to the end of the tape if left alone. This leads to the following questions:

1. Does the Supermon program record the machine language programs in the proper format to be loaded as above?

2. Is there a way to force the Commodore key character into the keyboard buffer so as not to have that interruption?

3. I have a *Frogger* cassette from Sierra On-Line that has you load the program the same way that Commodore recommends for machine language, with LOAD "Frogger",1,1. Yet this program does seem to have a short BASIC program with a SYS command as part of it, that can be loaded in the normal BASIC way. How do they make both the BASIC and machine language sections load sequentially with the same LOAD command? And how do they make the program come up running, even though only a LOAD command was used?

Furthermore, is there a way that the Supermon program can be relocated, perhaps at the top of memory, so that the BASIC program can be written after the machine language is complete? As it is now, the beginning machine language parts of Supermon seem to come in just above the BASIC program section, at around $0880. I have been able to resave the Supermon program on another tape without the problems mentioned earlier.

Also, I have seen in many programs the use of the memory location at 197 (decimal) to determine which key on the keyboard is being pressed. Although I see in my reference guide that this location holds the value of the key being pressed, that value does not correspond to either ASCII or screen display codes. I must assume that this is some sort of keyboard scan code, but I don't find a key to that anywhere in the reference guide. Can you outline this decoding for me?

John A. Schmitz

Jim Butterfield replies:

1. *The .S (Save) command in Supermon64 writes program tapes which may be loaded from BASIC. Some special considerations:*

a) Tape is written in a special "nonrelocatable" format, so that a simple LOAD "NAME" will return the program to the addresses from which it was saved. It is not necessary (but doesn't hurt) to say LOAD "NAME",1,1 since the tape format means that the program will never be relocated. By the way, this format tape may be read on VIC or 64, but not on PET/CBM.

b) Commodore machines have a bug that makes it virtually impossible to write tape from addresses above 32766 (hex 7FFE). Supermon doesn't fix the bug, so you cannot write useful tapes from high addresses.

c) If you have a BASIC program that contains a command to LOAD a machine language program, the load will take place correctly, but then the BASIC program will go back and start to execute from its first statement. This can give the impression that the computer is "locked up." The coding to get around this is quite easy:

```
100 IF A=1 GOTO 200
110 A=1
120 LOAD "NAME"
200 ... continuing
```

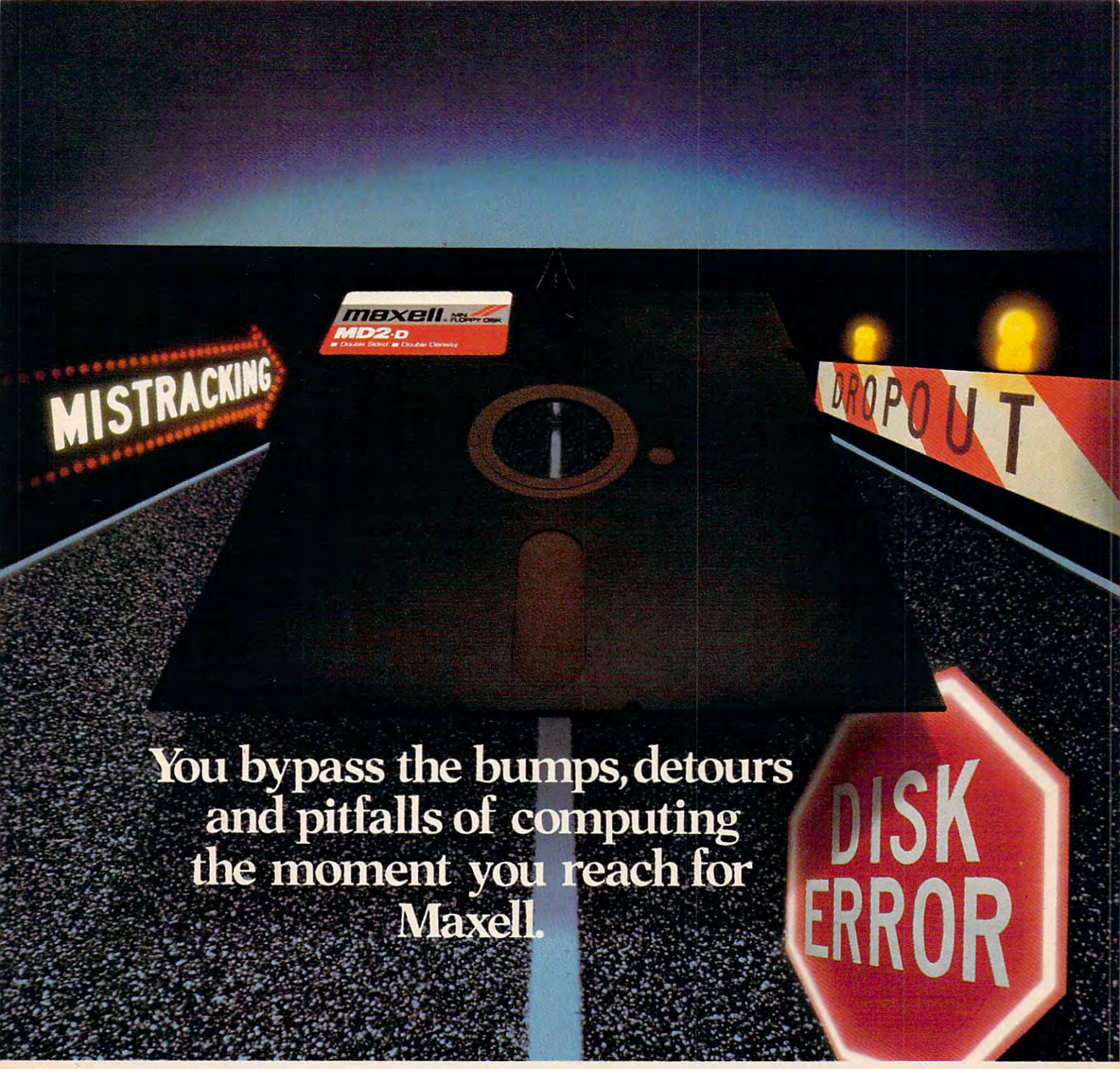
2. *No. The computer looks at the "keyswitch" indicator (address 145) to see if you are holding down the key. In any case, the Commodore key doesn't ever go into the buffer; it's a type of shift key.*

Newer models of the Commodore 64 will automatically continue a Load after a pause of a few seconds. Only the early models wait forever for you to tap a key.

3. *Machine language can be "batched" together with BASIC so that both may be loaded in one shot. The most popular methods are:*

a) Placing machine language directly above the BASIC program. Programs constructed in this way handle as easily as simple BASIC programs: They can be loaded or saved easily with no special knowledge. But the BASIC program must not be changed once the whole thing has been put together.

b) Placing machine language below BASIC. Programs constructed in this way must usually be loaded with LOAD "NAME",1,1 to avoid relocation problems.



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They are difficult to save, since the user must know the address at which the machine language program begins. An extra feature that can be implemented with this method: We can change some of the computer's "pointers" that lie below BASIC, and cause the machine to change its behavior. For example, pointers can be changed to make the computer "come up running."

Other questions:

Once you run Supermon, it will automatically relocate itself to the top of memory. You are free to return to BASIC and load new programs. Supermon may be recalled with SYS 8.

The value in 197 on VIC and 64 indicates the key being pressed as part of a keyboard x-y grid. Any value less than 64 indicates a key: 64 is no key.

It's probably best to use PEEK(197) together with the GET command. GET tells you which key; 197 tells you if it is still being held down.

"Atari Softkeys" Printer Utility

I've grown tired of typing myriads of CHR$(X) printer control commands, and looked for something better. I checked through my files, and rediscovered Bill Wilkinson's program "Atari Softkeys" ("Insight: Atari," COMPUTE!, May 1982). This program is an ideal solution to my problem, except for the caution that the equates to the OS routines are for the Revision A ROMs.

I suspect that most people now have Revision B ROMs, so could Wilkinson (or someone) please provide the equate changes necessary for the program to run with Revision B ROMs.

G. J. Marrs

True, the majority of Atari owners now have the new upgraded Operating System (and many may not even know they do). The improvements required some changes, primarily in the interrupt handling system. Fortunately, both operating systems are fairly compatible, as long as no illegal calls are made. The Softkeys program required patching into some of those illegal entry points, so Wilkinson warned that his equates were for the Revision A ROMs.

As it turns out, none of the entry addresses required by the Softkeys program changed; Softkeys will run on either Revision A or Revision B ROMs. It won't run on the 1200XL, and likely won't run on any of the newer XL series computers, since more drastic changes have been made to their operating systems.

Load Errors With 64 CP/M

I have a 64 with a 1541 disk drive, and have just bought a Commodore 64 CP/M Cartridge. While making a backup copy of the CP/M System, I got a READ ERROR message. This error occurred on every attempt. I finally made a copy on my dealer's disk drive. I don't have any problem with my disk drive in loading and saving other programs.

Also, while using the Editing Command such as ED SAMPLE.TXT to create a new file, I got BDOS ERROR ON A: BAD SECTOR, no matter which disk drive was used.

Would you please answer these questions:

1. Do I have a bad disk drive or a bad diskette of the CP/M System?

2. I intend to add a second 1541 disk drive instead of using a CBM 4040 dual disk drive. Will CP/M recognize them as Drive A & B?

3. Do I have to specify the computer and disk drive I use when ordering a COBOL Compiler?

W. P. Ling

1. *This sounds like an alignment problem. If your 1541 is only slightly out of alignment, you may still be able to access most files without getting read or write errors. Alignment problems are more likely to show up when the drive accesses the innermost and outermost tracks of the disk. This is because the read/write head is at the limits of its range, and CP/M stores its system files on tracks 1 and 2, the outermost tracks. Since the system files are accessed frequently, correct alignment is critical if CP/M is to operate properly.*

2. *On the 4040, the drives are designated drive 0 and drive 1, which CP/M recognizes as drives A and B. However, if you connect two 1541 disk drives to your 64, both are designated as drive 0, with different device numbers (usually 8 and 9). Since CP/M looks at the drive number and not the device number to find drive A or B, it will not accept the second 1541 as drive B.*

3. *Yes. However, we know of no COBOL compilers currently available which operate under CP/M for the 64.*

Return To BASIC From Machine Language

I am a VIC computerist, proficient in BASIC and learning machine language. I have a question.

When I have a BASIC program with machine language subroutines and control is transferred between them, what ways are there to transfer back *from* the machine language routines besides using BRK?

Drew Jenkins

The machine language instruction you want to use is RTS (ReTurn from Subroutine). The RTS command ($60 or decimal 96) is a single-byte instruction that will transfer control of a machine language program back to BASIC.

It works like this. When a SYS command (branch to machine language program) is issued from within a BASIC program, the operating system automatically pushes necessary information onto the stack that tells the computer which BASIC line is to be executed next.

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Control of the program is then transferred to the machine language subroutine.

When an RTS is encountered within a machine language program, this "return address" information is pulled off the stack, and control is transferred back to the BASIC program at the proper place.

PET Printer TAB Solution

My computer system consists of a 2001 series BASIC 4 PET, MX100 printer, and 2130 disk drive. Most of my software was obtained from magazines, especially COMPUTE!. By extracting portions of many programs, I developed the programs I needed to keep track of rental property, income tax, and other business applications.

One problem I have is with tabulation. Tab works fine on the CRT, but poorly on the printer. However, I find my printer will tab properly if I include the line A$=CHR$(141) in the program and insert the variable, in this case A$, before the TAB statement.

When the variable is used, the printer tabs from the beginning of the line, and without the variable the printer tabs from the last cursor position.

Ernest R. Walker


```
5 REM SAMPLE PROGRAM                    :rem 243
10 OPEN130,4:CMD130                      :rem 41
20 A$=CHR$(141)                         :rem 236
30 REM LINE WITH VARIABLE A$             :rem 86
40 PRINTTAB(10)"COMMODORE";A$TAB(20)"PET"
   ;A$TAB(24)"COMPUTER"                 :rem 155
50 PRINT                                :rem 242
60 REM LINE WITHOUT VARIABLE A$          :rem 81
70 PRINTTAB(10)"COMMODORE";TAB(20)"PET";T
   AB(24)"COMPUTER"                     :rem 212
80 PRINT#130:CLOSE130                   :rem 240
```

Calculating Branches

I have just started programming my VIC-20 with machine language. I don't have an assembler/monitor and I don't know how to calculate the offset for branch instructions. Could you please clear this up for me?

Keith Stout

The "offset" branches you've asked about (which include BCC, BCS, BEQ, BMI, BNE, BPL, BVC, and BVS) are easily calculated. The format for the commands is OPERAND / OFFSET, where OPERAND is the desired branch command (BEQ, BNE, etc.) and OFFSET is a single-byte value.

Whether branching forward or backward, the offset is calculated by counting from the next byte after the offset byte of the branch instruction. For an example, take a look at the following program sample.

```
1000 LDA $C000
1003 STA $FB
1005 CMP #$FF
1007 BNE $1000
1009 BEQ $1011
100B JSR $2000
100E JSR $3000
1011 RTS
```

The branch (BNE) at address 1007 is calculated by counting backward starting at address 1009 (the byte following the offset value). In this case, the offset value would be 256–9 or 247. Backward branches are calculated by subtracting the offset value from 256. The forward branch (BEQ) at address 1009 is accomplished by counting forward from byte 100B. In this case, the offset byte's value is 6.

Because the offset type of branch instruction uses a single byte for the offset value, the distance you can branch within the program is limited to 128 bytes backward and 127 bytes forward.

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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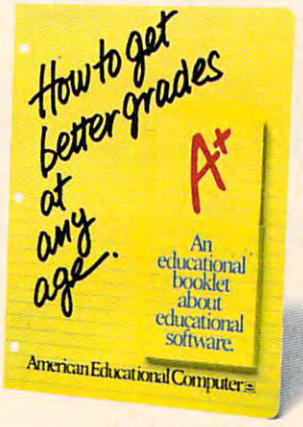

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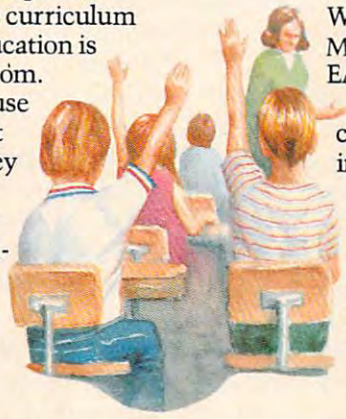

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All About Adding Peripherals

Ottis R. Cowper, Technical Editor

In the November 1983 issue we examined some of the factors to be considered when purchasing computer peripherals. This month, let's look at some add-ons available for home computers, how they work, and why you might want them.

Tape And Disk Drives

Mass storage devices—disk drives and tape recorders—are a necessity unless you're only planning to use cartridge software.

Tape units and disk drives really aren't luxury items—you've got to have one or the other, unless you're using only cartridge software or you're willing to type in a program every time you want to use the computer. The drives are called mass storage units because they allow you to store large amounts of information for later use.

Despite their different appearances, tape and disk drives use a similar technology. Both create and interpret specific magnetic patterns on a special recording medium, the same process used in audio recordings.

In a tape drive, the recording and reading head is fixed, and the tape moves past it. As the tape goes by, the head can either create a new magnetic pattern on the tape (record) or interpret the magnetic pattern currently on the tape (read). A tape drive is a sequential device; to get to the last program on a tape you have to wait for all the preceding programs to pass by.

The Head Moves In A Disk Drive

You may understand a disk drive better if you think of the diskette as a circular slab of recording tape, which is just what it is. In a disk drive, the head is not fixed, but can move back and forth across the surface of the disk. The advantage of this is that the disk head, unlike a tape head, doesn't have to wait for the desired part of the recording to come along. Instead, it can jump directly to the spot on the disk where the desired information is stored. The drawback is that the disk drive's moving head must be positioned very precisely, to within a small fraction of an inch. It is this added degree of precision that makes disk drives more expensive than tape units.

Which storage device you choose is to some extent a matter of personal preference and to some extent is determined by your planned application. If you're only planning to store programs and small amounts of data, and you feel that waiting a little longer for programs to load is a good trade-off for a much lower price, a tape unit will probably

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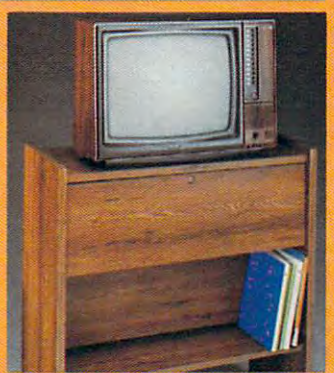

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The two slide-out shelves put the keyboard at the proper operating height while allowing easy access to the disk drives.

The bronze tempered glass door protecting the keyboard and disk drives simply lifts up and slides back out of the way during use.

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.

The cabinet dimensions overall: 39-1/2" high x 49" wide x 27" deep.

Keyboard shelf 20" deep x 26" wide. Disk drive shelf 15-34" deep x 26" wide. Top shelf for monitor 17" deep x 27" wide. Printer shelf 22" deep x 19" wide.

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Chalk Board's revolutionary PowerPad eliminates fear of keyboards and opens up a new world of fun and adventure with computer systems. PowerPad's 12″x12″ touch-sensitive, multiple contact point surface literally puts users *in touch* with their computers. Without the limitations of confusing keyboards and commands, users can now draw on the PowerPad and see their ideas appear on the screen.

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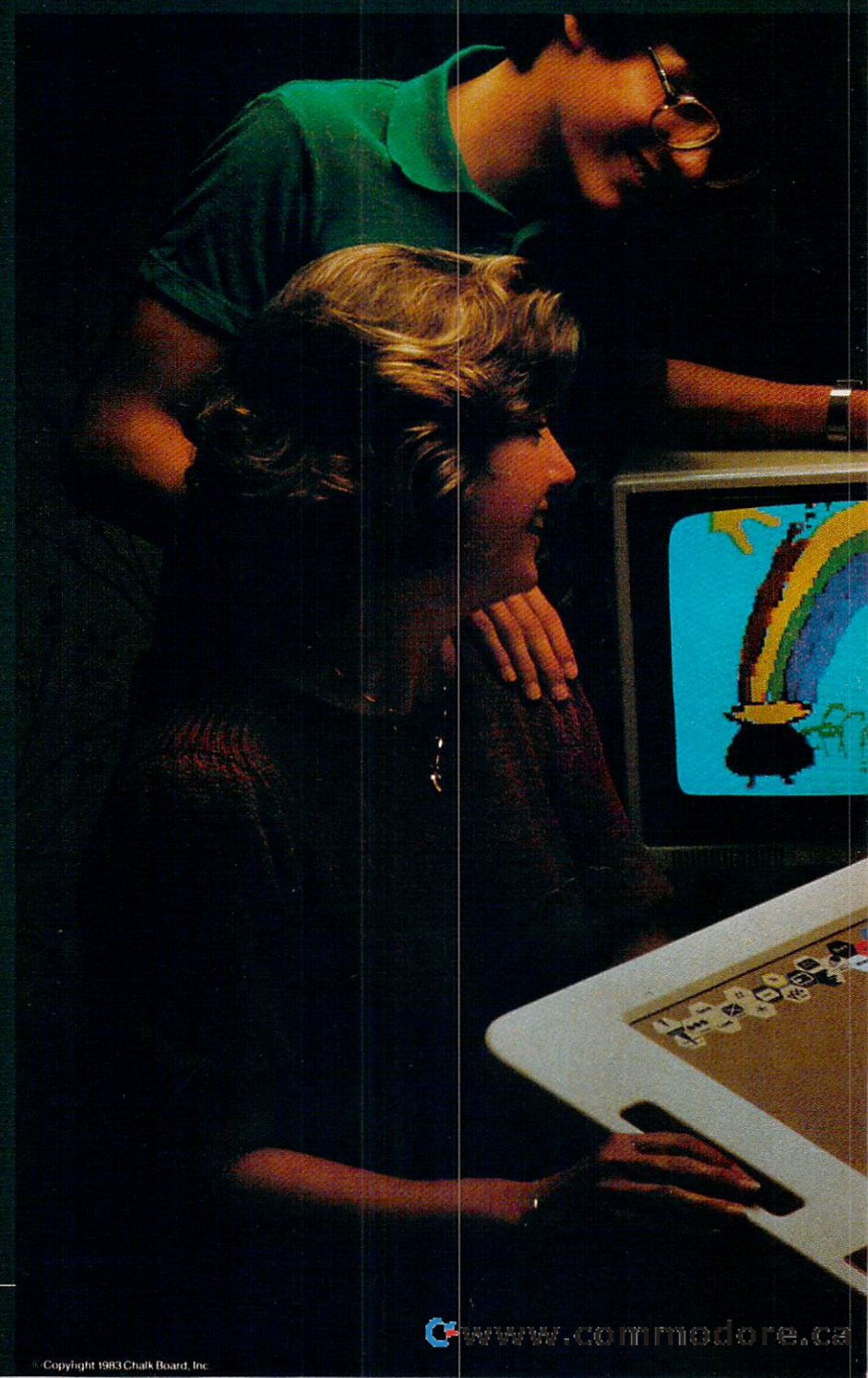
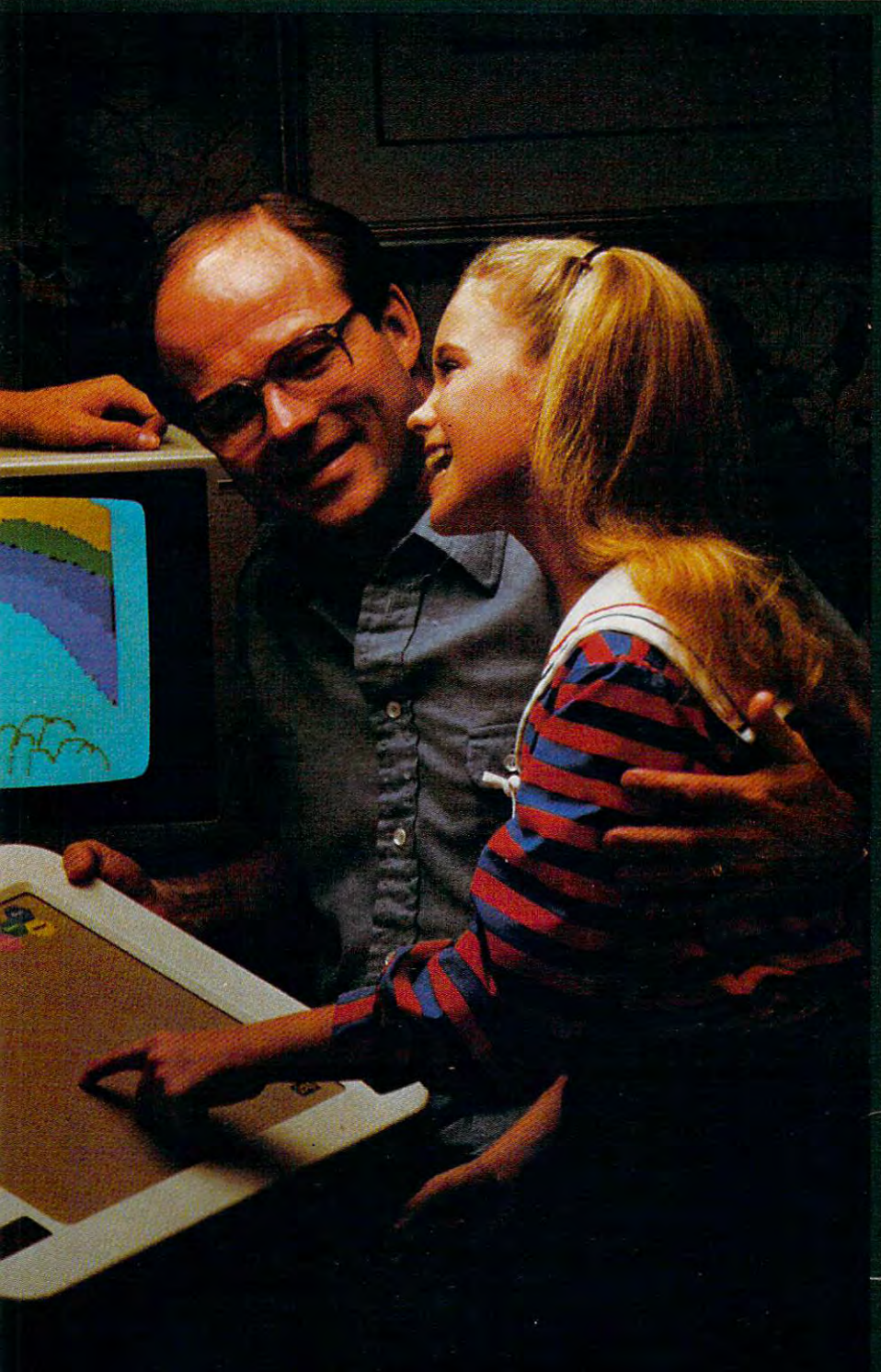


oard. It's a drawing pad, no keyboard, a jigsaw puzzle, ...and more.



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be sufficient. Using tape might also be a good idea if children are the primary users of the computer. Cassettes, unlike diskettes, are sturdy and can withstand quite a bit of abuse.

On the other hand, if you are handling large amounts of data or if you don't want to wait several minutes for long programs to load, a disk drive is the obvious choice. For word processing, most users choose the disk drive because of the volume of data which must be stored and retrieved.

Also, if you will be purchasing software on a regular basis, consider the format in which most software for your computer is available. For example, most commercial software for those computers which do not accept cartridges is available on disk, which would necessitate a disk drive.

Disk And Tape Alternatives

Alternatives to tape drives and disk drives are available. For example, there's the stringy floppy, or wafer tape drive. Stringy floppies store data on tape, but the tape is in a loop and operates much faster than standard cassette. These devices usually cost more than tape drives, but less than disk drives.

For the really high-volume user who must handle very large amounts of data at very high speeds, there is the hard disk. The technology is the same as for diskettes, except that the recording medium is bonded to a metal plate that rotates at very high speeds.

Most hard disks are permanently mounted in their drives, although a number of models have been recently introduced for which the disk is in a removable cartridge. Many diskettes would be required to hold the amount of data which can be stored on a single hard disk, and the data can be stored and retrieved much faster. However, hard disk drives tend to be quite expensive, so they are common only among the most serious home computer users.

Game Controllers

Despite all the claims of utilitarian applications, most home computers are at least occasionally used to play games. Almost all games require the player to control some sort of action on the screen. While the keyboard is useful for entering programs into the computer, you will, unless you have exceptionally nimble fingers, find it only marginally acceptable as a game controller. Fortunately, there is a wide range of alternatives.

The most common game controllers are the ubiquitous joysticks. These come in two basic types. In joysticks for the Atari, Commodore, TI, and Coleco computers, moving the handle of the joystick closes one or two of four switches. If only one switch is closed, one of the four horizontal or vertical directions has been selected (left, right, up, or down). Pulling the handle in one of the four diagonal directions causes two of the switches to close simultaneously. Thus, these joysticks allow you to select one of eight directions.

Game controllers come in a variety of styles, each of which has a different "feel." Shown here are paddles, a joystick, a trackball, and a pressure-sensitive controller.

Directional vs. Positional

If we call the previous type a directional joystick, then the type used on the Apple, TRS-80, and IBM is a positional joystick. Moving the handle changes the setting of a pair of variable resistors, one on the horizontal axis and one on the vertical axis. This has the effect of changing the voltage level of the joystick output.

Though the switches in a directional joystick can be read directly as a number by the computer, additional circuitry is required to measure the voltage levels from a positional joystick and to calculate an appropriate value for the horizontal and vertical (X,Y) position of the handle. In a typical positional joystick, holding the handle in the upper-left corner produces a reading of 0,0. The upper-right corner is 0,255; the lower-left 255,0; and the lower-right 255,255. Values for other positions fall somewhere in this range, the center being around 127,127.

Many varieties of both types of joysticks are available, and choosing among them is strictly a matter of taste. Some joysticks have huge handgrips, some have slim handles, and others have knobs on top. Some have a push button on the base of the unit, others have one on the handle, and others offer you a choice of either. Some people prefer heavy joysticks with firm handle motion; others prefer lightweight models with handles that move freely. Before selecting a particular joystick, it's wise to go to your local computer products dealer and take a few "test drives."

The next most common type of game controller is the paddle. A paddle is essentially half of one of the positional joysticks described above.

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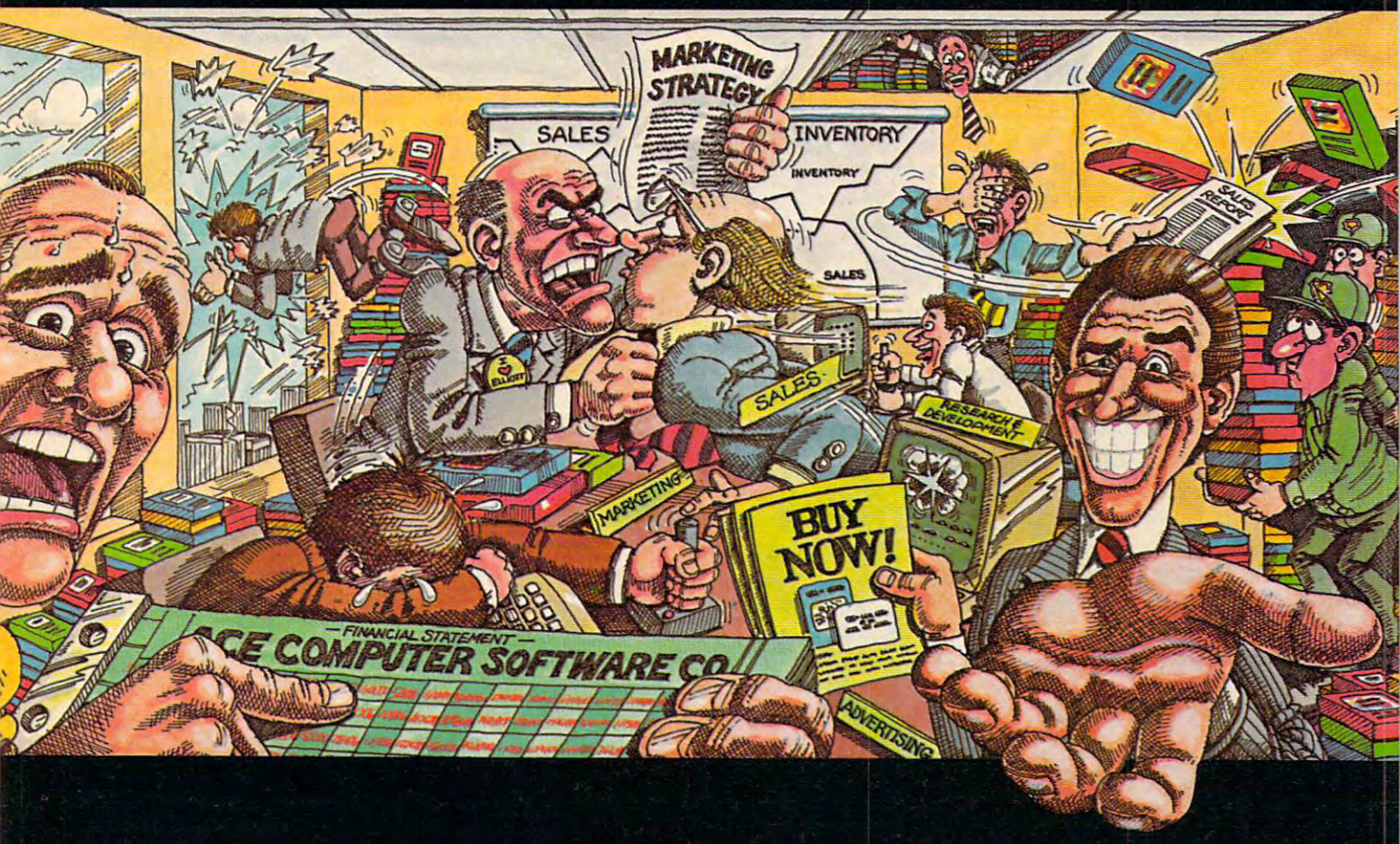

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The knob on the paddle controls a variable resistance, hence a variable voltage, which is translated by computer hardware into a number that reflects how far left or right the paddle is turned. Paddles are generally used in those games which involve only left-right or up-down movement, but not both. Paddle controllers usually come in pairs, but are not available for all computers.

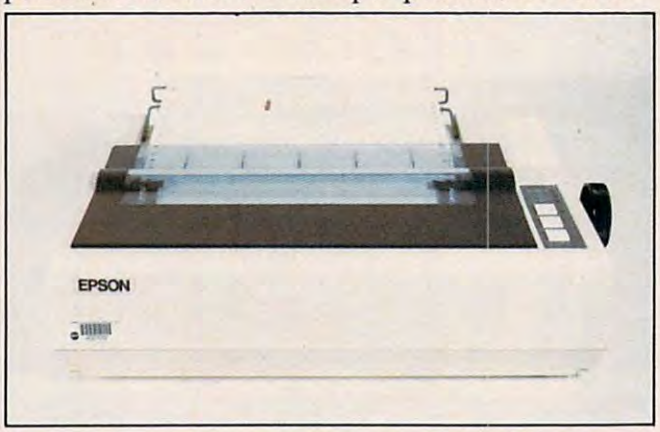
Some Specialized Controllers

The other types of game controllers tend to be highly specialized. For example, there is the trackball, which can be used in place of a directional joystick. Briefly, spinning the ball activates circuitry which produces the same effect as rapidly pushing the joystick in the direction that the ball is spun. Thus, the trackball can be a good replacement for a joystick in games that require rapid movement all over the screen.

Before you buy any game controller, take a minute to measure just how far from the computer you'd like to sit when you're playing a game. Then, when you pick out a controller, make sure its cord is long enough. Of course, if the one you want comes up short, joystick extension cords are available. Or, if you want to free yourself from all those wires, Atari has a joystick with no wires at all. A small radio transmitter, built into the base of the joystick, signals to a receiver which you plug into the computer's joystick port.

Printers

Printers are among the most popular peripheral devices, and most computer owners plan to add one sooner or later. Printers allow you to make permanent copies of program listings and output, as well as copies of screen displays and graphics patterns. As with all other peripherals, the available printers vary widely in price and quality.



A printer, among the most popular of peripheral devices, allows you to make permanent copies of program listings and program output.

There are three basic types of printers for home computers: thermal, dot matrix, and daisywheel. All function by accepting character codes and translating them into printer commands to place the image of the desired character on the page. They differ in how the character images are produced.

The printhead of a thermal printer consists of a horizontal or vertical row of small electrodes. As the printhead moves across the paper (or, depending on the printer, as the paper moves past the printhead), the electrodes burn a tiny dark spot in the specially coated surface of the paper. The printer creates the dots in patterns that form the various alphanumeric characters, just as characters are formed on the video screen by lighting up tiny dots.

The advantages of thermal printers are that they are quiet, durable, and inexpensive. The disadvantages are that the special paper required is more expensive and usually a bit more difficult to find than regular printer paper, and some types of the paper tend to turn dark with age.

Dot-Matrix Printers

The concept behind dot-matrix printers is similar to thermal printers—in both the printed characters are formed from patterns of dots. However, rather than burning the dots into special paper, the printheads of dot-matrix printers have a vertical row of tiny wires or *needles* that strike an inked ribbon against standard paper. The number and size of the dots produced per character determine the printing quality.

The characters to be printed are formed within a grid, like the eight-by-eight grid used for designing characters on most home computer screens. A common arrangement is nine dots high by five dots wide. More dense arrangements allow for better character definition and hence better looking characters.

The daisywheel in printers of that type has the characters that can be printed arranged on the *petals* of the printwheel. It's as if someone picked all the letters out of a standard typewriter and arranged them in a circle. To print a character, the printer rotates the printwheel until the desired character petal is at the top, then strikes the petal against an inked ribbon just as in a regular typewriter.

Superior Print Quality

As might be expected, the printing quality of a daisywheel is also similar to that of a typewriter. Balanced against this superior print quality, daisywheel printers are both more expensive and, in general, slower than thermal or dot-matrix printers.

When deciding which type of printer to buy, consider how you will be using the printer. For example, if you simply need to whip out an occasional program listing, an inexpensive 40-column thermal or dot-matrix printer should suffice. If

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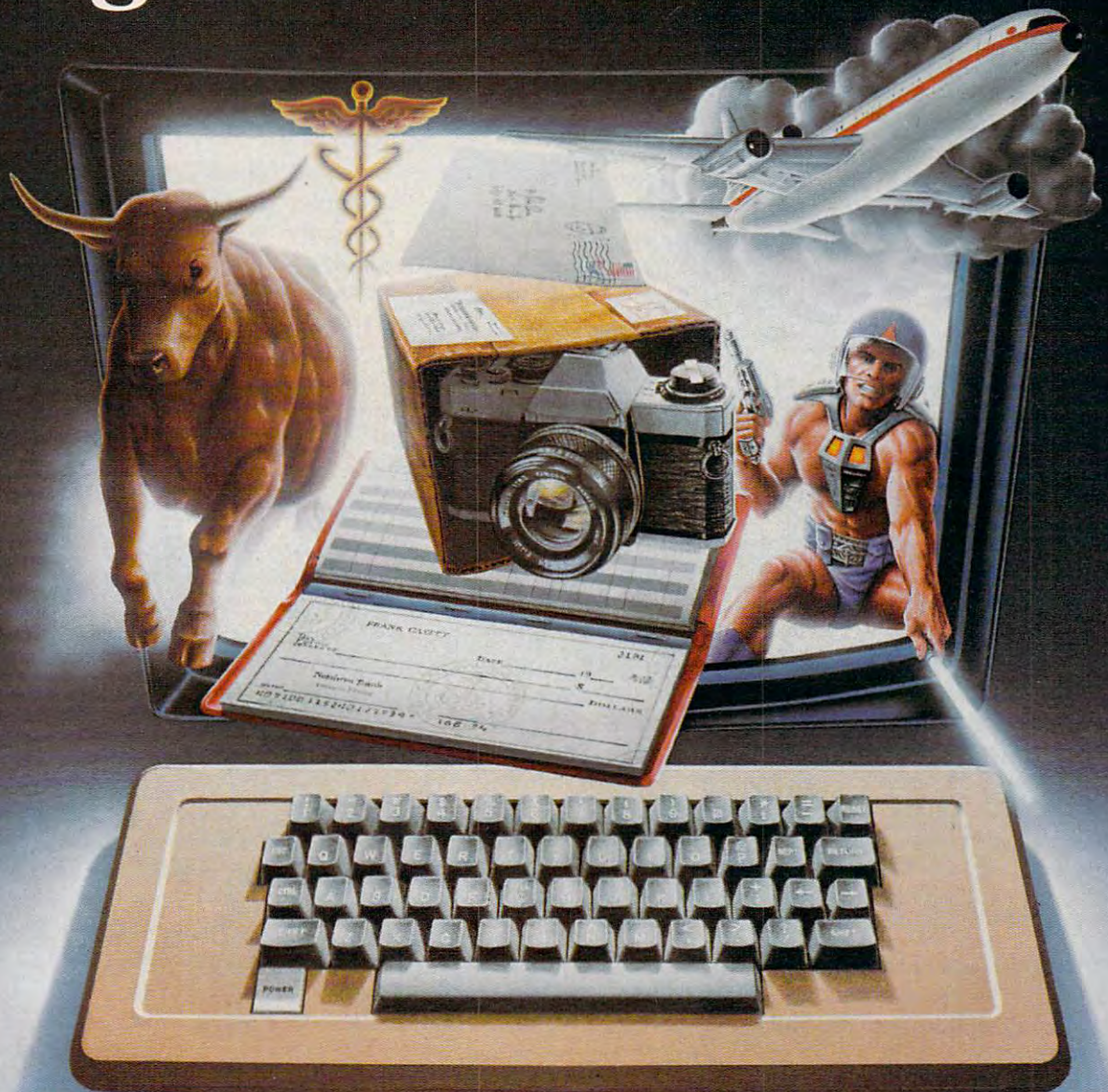

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you wish to do word processing, you'll probably want a printer that can give 80 or more columns of output so that you can use standard paper. For casual writing or correspondence, a good quality dot-matrix printer is quite acceptable. However, a daisywheel printer is usually required for serious word processing which demands a professional, typewritten appearance. On the other hand, if you're interested in printing out charts and graphs or screen images, you'll need the graphics capabilities of the thermal or dot-matrix printer. In any case, try to see a sample of the printer's output before you buy so that the print quality won't come as a rude shock the first time you use it.

Serial And Parallel Interfaces

There are two methods of sending data to printers, serially (one bit at a time) and in parallel (eight bits at a time). Some computers allow printers to be plugged in directly, but most require special interfaces. You should choose the interface before, not after, you buy the printer, so that you can be assured of being able to connect the printer to the computer.

There's really no compelling reason to choose serial interfacing over parallel or vice versa, except that parallel printers are generally less expensive. Your computer could be a determining factor, since some computers have their built-in printer handling routines set up to prefer one method over the other.

Other types of printers are available. For example, there are dot-matrix printers which can print in a variety of colors. There are ink jet printers which produce exceptionally sharp characters on the page by spraying microscopic droplets of ink in carefully controlled patterns. There are even printers which use a laser to form characters which almost match the quality of typesetting. However, these printers are currently too expensive for most home users.

Modems

Modems (modulator/demodulators) are your computer's link to the outside world. They open to you the world of telecommunications, allowing your computer to exchange information with other computers.

A modem translates digital data from the computer into sound signals that can be transmitted over the phone lines, and converts sound signals from other modems back into digital data for the computer. There are two types: acoustic and direct connect. With an acoustic modem there is no direct connection between the computer and the phone line. The mouthpiece and earpiece on the phone handset fit into cups on the modem.

Modems let your computer exchange information with other computers via telephone lines. Direct connect modems plug directly into the phone line. With an acoustic modem, the telephone handset fits into a pair of soft cups.

A direct connect modem plugs into the phone line. Rather than creating audio signals, it impresses the equivalent electrical signals directly on the phone lines. This prevents the direct connect unit from picking up stray noises as data, which is sometimes a problem with acoustic modems. Plugging into the phone lines also makes possible several advanced features, such as auto-dial and auto-answer, whereby the computer can dial or answer the phone by itself. However, these features are found only on the more advanced direct connect modems.

Who Do You Want To Talk To?

To determine if you can use a modem, you must first ask yourself if there is anyone out there you and your computer want to talk to. There are several companies that specialize in providing telecommunications services to small computer owners, most notably CompuServe and The Source. Many modems come with information on accessing one or both of these services. In addition to the large companies, many computer clubs and user groups around the country maintain electronic *bulletin boards* that you can call for exchanging information, messages, and perhaps even programs.

If you have a friend with a computer and modem, you can exchange programs and messages directly between your computers. Keep in mind that unless there are a number of services you can use locally, you may find yourself running up excessive long distance charges to make use of your modem.

Memory Expanders

Memory expanders do just what they say: give you more memory for programming and storage. If you find yourself running into OUT OF MEMORY errors on a regular basis, or if you're planning an application which will involve the storage and manipulation of large amounts of data, you may want to consider purchasing one of these units.

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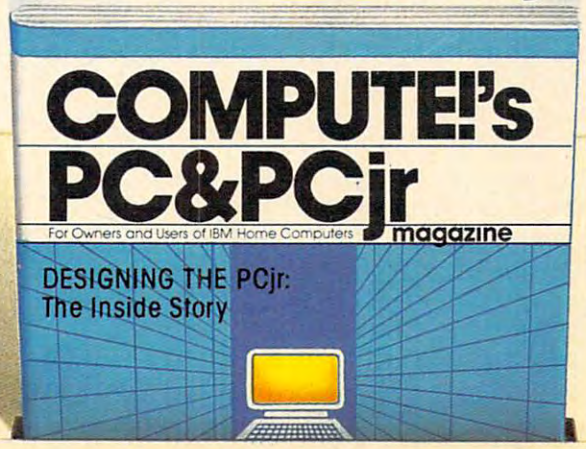

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Memory expanders give you additional work room within your computer. Expanders range from simple memory chips to complicated boards with cartridge slots and reset buttons.

On the other hand, if you aren't experiencing these problems, you probably don't need any additional memory, unless you're troubled by the fact that your neighbor has more kilobytes than you.

The simplest memory expanders just give you more of what you don't have enough of, RAM (Random Access, or read/write, Memory) chips, along with the circuitry to determine the addresses of the new memory locations. These are for computers which haven't yet reached their full memory capacity.

There are also more sophisticated memory expanders for computers which already have as much memory installed as their microprocessors can address. These use a special technique called *bank switching*, whereby blocks of memory can share the same addresses as long as only one of the blocks is in use at a time. The blocks of memory that are not switched in will still retain data until they are again selected. This switching, of course, requires extra circuitry and hence extra cost.

Some memory expander packages, especially those for the VIC, add extra features such as cartridge slots and reset buttons. Some memory expander cards for other computers allow you to buy the card with less than the maximum number of memory chips installed, so you don't have to pay for all the extra memory at once, but won't need another card when you purchase additional memory later. Try to buy a card that holds the greatest possible number of memory chips so that future expansion will take no additional card slots. These are the sorts of features that you should consider when shopping for memory expansion.

Additional Input Devices

A number of peripherals are available which make it easier to communicate with your computer. These include the numeric keypad, the light pen, the touch pad, and the mouse. All provide ways to get information into the computer without touching the keyboard.

Most home computers have keyboards like those of typewriters. This is fine for typing in text, but programming often involves entering lots of numbers. Here the typewriter keyboard fails, because having the number keys in a row across the top slows down your numeric typing. A numeric keypad is essentially a small second keyboard you plug into your computer. It has the number keys laid out in the familiar calculator pattern, with perhaps a few extra keys for additional functions. You'll need a program to allow your computer to read the keys. This add-on will be especially useful in financial applications where many figures must be entered.

The light pen is a device that lets you point to a location on the screen and have the computer know where you are pointing. To understand how it works, a short description of the TV display is in order. A video display is not a static picture. The image on the screen is actually flickering constantly, but at a rate of 60 times per second, which is too fast for your eyes to notice. An electron beam draws a series of stacked horizontal lines on the screen from top to bottom to form the display.

When you hold a light pen to the screen, the computer times how long it takes the beam to draw from its starting position at the upper left of the screen to the point where you're holding the pen. From this, the horizontal and vertical position of the pen on the screen can be calculated.

Using A Light Pen With Menus

Light pens are most often used with screen drawing routines. In fact, this is such a common application that many people don't realize that light pens can be used for anything *except* drawing on the screen. Even the name is somewhat misleading. Light pens are suited for any application which involves getting information on or off the screen. For example, a program in which the user must select an option from a menu on the screen could be set up so the user makes his selection by touching the light pen to the desired option instead of having to type in a letter or number to indicate the choice.

A touchpad is an input device consisting of a tablet with a square sensing surface. If you press down somewhere on the surface, the pad will provide a pair of values that represent the horizontal and vertical location of the point being pressed. The pad uses thin sheets of resistive film instead of a variable resistor, but the principle of operation is otherwise the same as that described for positional joysticks.

As with light pens, touchpads are most often used to create screen drawings. In fact, you've probably seen engineers on TV using very

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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.

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

sophisticated touchpads and mainframe computers to do very complex designs like blueprints for cars or airplanes. The simple touchpads available for home computers can't match that, but the principle is the same.

The hottest new input peripheral on the computer scene is the mouse. A mouse is essentially a small trackball turned upside down. Mice (or mouses—the proper plural for the computer version has not yet been decided) are used to position

Light pens, touch tablets, and numeric keypads provide alternative ways of entering data into your computer.

a cursor on the screen. Instead of typing cursor control keys, you place your hand on the mouse and roll it up, down, left, or right on the table. The program using the mouse will cause the cursor to move accordingly. The mouse is supposed to be more user-friendly for beginners than the cursor keys, and mice are featured prominently in new software for such computers as the IBM PC and Apple Lisa. Experienced typists may find, however, that taking their hands off the keyboard to move the mouse is more distracting than using the keyboard cursor controls.

Exotic Additions

Speech synthesizers. Talking computers have long been a favorite of science fiction writers. Now it seems that their day has arrived. The production of speech by a computer is similar to the production of musical tones, except that instead of producing notes, the speech synthesizers produce *phonemes*, the sounds which make up basic units of human speech. By stringing these phonemes together, speech synthesizers can produce words. We've even seen packages that allow the computer to sing, play background music, and display a face which moves its mouth in synchronization with the song.

The limitations of speech synthesis in home computers relate largely to memory. The sounds of human phonemes are complex and require extensive programming to simulate. Also, the sound production capability of many of today's home computers is somewhat limited. Nevertheless, speech synthesizers are available now for most home computers, and as units with more memory and better sound become available, the use of the synthesizers should become more widespread.

Speech recognition units. These are the opposite of speech synthesizers. Instead of allowing the computer to speak, they allow the computer to understand spoken commands. Speech recognition is not yet as advanced as speech synthesis because there are so many subtleties to human speech. For example, regional dialects cause people to pronounce the same word in different ways. Then there is the problem of words with different meanings which are pronounced the same or nearly the same, such as *for* and *four*, *eight* and *ate*, etc.

However, speech recognition units are available for several computers, and even a version of BASIC called SpeechBASIC to accept spoken commands. Since so much of human communication is based on the spoken word, the ability to talk directly to your personal computer would certainly make it more personal. Watch for progress in this area.

Plotters. A plotter is essentially a mechanical drawing arm. It consists of a pen which can move horizontally and vertically across a drawing surface under computer control. By carefully controlling the pen's movements, detailed drawings can be created. Sophisticated plotters can even select from several different pens for multicolor artwork. If you're interested in producing graphics of a higher quality than is possible with a dot-matrix printer, you may want to investigate the variety of plotters available. Be forewarned that some serious programming may be necessary to get your computer to produce draftsman-quality work.

Coprocessors. Adding an additional microprocessor to your computer is like giving it a second brain. For example, Z-80 microprocessor add-on boards are available for the Apple and Commodore 64 to allow those computers access to the wide array of software written for the CP/M operating system. A special math processor is available for the IBM PC to increase the speed at which mathematical calculations can be performed.

Many other types of peripherals are available for today's home computers. For example, there are interfaces which allow your computer to turn the lights in your home off and on at programmed times, or to adjust your home thermostat. Other interfaces allow your computer to control video cassette recorders. There's even a peripheral to allow your computer to monitor the temperature, humidity, and barometric pressure to forecast the weather.

This continuing stream of new products shows that we're still far from reaching a limit to what can be connected to a home computer. ©

BRISTLES

designed by Fernando Herrera

Starring Peter the Painter

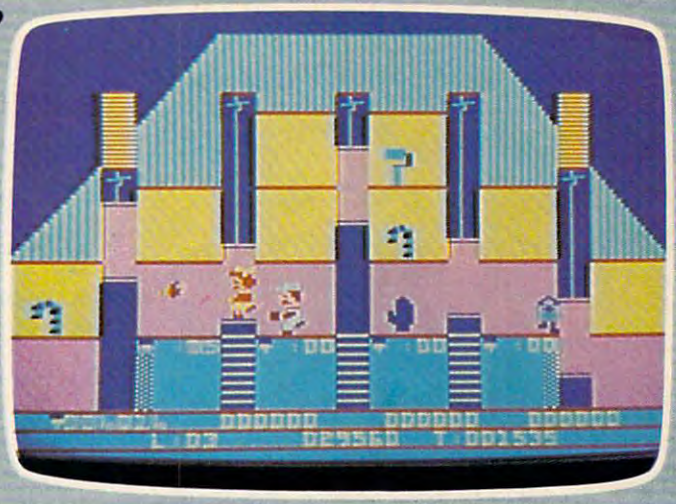
C-64 conversion by Adam Bellin

From the creator of ***ASTRO CHASE***™ (Sci-Fi/Fantasy COMPUTER GAME OF THE YEAR, 1984)[1] and My First Alphabet™ (winner of the Atari® Star Award) comes BRISTLES.

☐ Reviews: A+ "The action is fast and frenetic … If you want a game with definite patterns, strategies, great sounds and plenty of action—this is the one."[2] #1 Best Selling computer software in New York.[3]

☐ Features: Real Time Animation™, Sex-Select™, Slow motion, 1 to 4 player option, hidden messages, 8 game screens each with 6 skill levels, hi-res graphics and "invisible paint."

☐ Systems: **COMMODORE 64**™ & **ATARI HOME COMPUTERS**™



Actual Game Screens

FLIP and FLOP

Starring Flip the Kangaroo and Mitch the Monkey

designed by James Nangano

C-64 conversion by Paul Kanevsky

This number one Best Seller is Jim's first game for First Star. Here's what the reviewers say about this award winning designer's first computer game.

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☐ Features: 7 different animated intermissions, game screen actually *flips upside down*, 36 levels, 13 different scrolling screens, arcade sounds and music, solo or 2 player option.

☐ Systems: **COMMODORE 64** & **ATARI HOME COMPUTERS**

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A Printer In Every Kiosk?

Peripherals In The Year 1999

Kathy Yakal, Editorial Assistant

Is it compatible with my computer? Will I need to buy extra cables? What if I decide to buy a different computer a year from now—can I still use the same modem? The issues of standardization and compatibility are likely to change in the next decade. What's more, new technologies are continually appearing in each new generation of peripherals.

Purchasing the *right* peripherals for your computer can be complicated. The buyer must make some complex technical choices: IEEE-488. Hayes-compatible. RS-232. Requires 80-column card. Requires special cables (available separately). IBM-compatible.

A Package Deal

One possible response to the compatibility problem is to avoid third-party hardware manufacturers and buy everything for your system from the company which made your computer.

Coleco encourages this with their new Adam system. "The reason we're offering a package concept is that we perceived a great deal of confusion in the home market," says Barbara Wruck, director of corporate communications at Coleco. "Many consumers were buying inexpensive CPU's, only to find out that that's all they had—a CPU.

"It's important to give the new computer owner every piece of equipment that lets them do it immediately, a system that is useful, easy to operate, and affordable." As an Adam owner grows in knowledge and needs new equipment, says Wruck, Coleco will continue to produce "carefully selected peripherals" to expand the power of the system.

Is this the answer to peripheral problems? "I think the consumer is saying that it is," says Wruck. "We believe this is the correct approach."

Like Buying A Stereo

Others disagree with this approach. "I think there will continue to be a niche for people who want to buy things separately and put together a system themselves," says Dan Baker, research manager for disk manufacturer Percom Data. "It might be the way component stereos are," he says. "You have different performance criteria for each piece to fit your needs.

"However, the move toward portable computers is something of a package concept, where you have built-in peripherals. This isn't necessarily a trend—it just shows that you can include storage in the main package."

A Standard

Buying any computer, disk drive, printer, and modem and having them work together at once might seem like high-tech heaven, but it's not

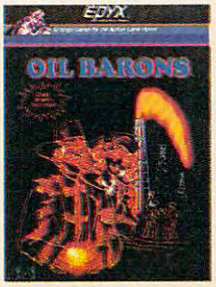
OIL BARONS.
IF YOU'RE SMART, YOU'LL GET FILTHY RICH.

Are you a gambler, eager for new challenges... ready to pit your skill and luck against others in an attempt to corner the world oil market? If so, Oil Barons is your game.

Starting with 4 parcels of land and over $1 million, you search for that ever-elusive gusher. The computer does all the work, including banking and scorekeeping, freeing you to plan your strategy and make decisions that will ultimately determine your success.

Obstacles like government regulations, well fires, and hurricanes complicate matters, but the fun of increased land holding, striking it rich, and even unloading worthless parcels on the uninitiated, more than make up for the setbacks.

One to eight players, 4 color gameboard and playing pieces included, keyboard controlled.



EPYX™ COMPUTER SOFTWARE

Strategy Games for the Action-Game Player

likely to happen. "I have thoughts in both directions," says Robert Pearce, director of marketing for Comrex, a subsidiary of Epson.

"As technology advances, that will wipe out any standardization that existed before," he says. "New technologies generally don't conform to the standards of the previous one. There *could* be standardization for a while, but then a new technology comes along and requires a whole new set of standards.

Next year more modems will be manufactured than have been built to date.

"If some uniform compatibility code does emerge, it will be because the masses force it. That may have to happen in order for computers to have the mass appeal that they lack now. If nothing else, at least in packaging, like Coleco and IBM have done."

Interfacing Your Computer And A Stereo

In 1999, it may be that electronic equipment which we don't now consider computer peripherals will act as such. Home entertainment equipment is an example.

To a degree, you can do some interfacing now. By hooking up a couple of cables, you can play *Missile Command* on your Atari 800 and hear the sound through your stereo.

For more sophisticated kinds of interfacing, special cables or cards may be necessary. Digital Controls, Inc. has a line of interface cards that turn videodisc players into microcomputer peripherals. An Apple II interface card is available for $500, and a generic RS-232 interface for $865.

A Different Approach

Telecommunications will most likely be a part of everyone's life by 1999. Presently, a home computer owner has a wide choice of modem, but there is an equally wide variation in compatibility. Some modems are completely compatible with one computer, but require special cables and interfaces for another computer.

B. F. Kessler, president of modem manufacturer Novation, Inc., feels that the answer to compatibility lies not in hardware, but in software. He points out that technology is changing so rapidly that modem makers are having a difficult time designing one generation of products that is compatible with the next.

"The fact that all modems should be compatible is obvious," he says. "But with an industry still in its infancy, it would seem stifling to set hardware standards that could become obsolete overnight."

Kessler believes that a good programmer is well equipped to solve compatibility problems. The emphasis should be on getting programmers to include software commands for expansion and compatibility with all popular protocols.

"Personal communication via microprocessors is gaining momentum at an amazingly rapid rate," says Kessler. "Next year more modems will be manufactured than have been built to date. Inevitably, new designs and technology will be introduced. And the marketplace will continue to respond positively to appropriate innovations.

"It will be far easier for software programmers to keep up with state-of-the-art than it would be to shackle hardware manufacturers with compatibility standards that undoubtedly would hinder rather than help the growth of the modem marketplace."

Visible Beginnings

Remember the scene in the movie *Blade Runner* when Harrison Ford needs to zoom in on a small area of a photograph and make a reproduction of it? There's nothing resembling an Apple IIe in his apartment, and no keyboard is visible anywhere. He sits down in front of some kind of electronic console, talks to it and tells it what he wants, and he ends up with a blowup of a tiny corner of the original that was barely visible to the naked eye. In seconds. Without touching anything.

High science fiction, certainly. Yet voice recognition is possible now. You can buy a Lang Systems, Inc., unit called the Videoslide 35 that will let you photograph the images on your computer screen and turn them into slides in less than an hour.

"The equipment is already here to accomplish many of the things that won't necessarily be commonplace for many years," says Comrex's Pearce. "We have high-speed modems that can transmit data from urban area to urban area, but it will be a while before we can give that kind of service to rural communities. Whether we continue to use the phone lines or switch to something like satellite communications, we'll still be using something like the modems we're using today."

A printer in every kiosk? "That's already happening to a certain extent, at places like automatic teller machines," says Pearce.

PITSTOP.
WHERE WINNING IS THE PITS.

You'll never make Grand Prix champion just driving in circles.

You've got to stop sometime. The question is when. Right now you're in the lead. But the faster you go, the more gas you consume. And the quicker your tires wear down.

If you do pull into the pits, though, you lose precious seconds. So it's up to you to make sure the pit crew is quick with those tires. And careful with that gas. Otherwise, poof! you're out of the race.

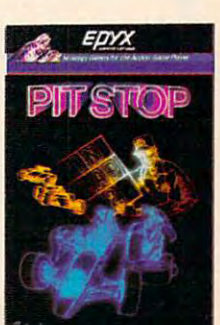
See your retailer for available computer formats.

So what'll it be, Mario? Think your tires will hold up for another lap? Or should you play it safe and go get some new ones?

Think it over. Because Pitstop™ is the one and only road race game where winning is more than just driving. It's the pits.

Goggles not included.

One or two players; 6 racecourses, joystick control.



EPYX COMPUTER SOFTWARE

STRATEGY GAMES FOR THE ACTION-GAME PLAYER.

"I suppose you might find printers in places like phone booths, say to print out time and charges after a call," he says. "But I think it makes more sense to have a credit card number and get a printed bill at the end of the month instead of carrying around all those little slips of paper."

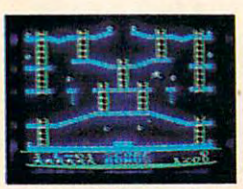
People, Not Peripherals

Emphasis on consumer education will help people deal with compatibility and sophisticated peripherals, Pearce believes. "I would like to see more education of the masses. I'd like to see dealers really taking care of customers.

"The computer is a sophisticated piece of equipment. Consumer confusion is partly the manufacturer's fault. He says, 'Here, just touch this screen, press this button. It's easy to use!' That only frustrates people when they find out it's not.

"I don't think we're going to see the trend of packaged systems go very far. I've always liked the concept of components—they give the consumer limited flexibility. There will always be a peripheral market." ©

JUMPMAN'S A GREAT GAME. BUT YOU'VE GOT TO WATCH YOUR STEP.



Meet the Alienators. A fiendish bunch who've planted bombs throughout your Jupiter Command Headquarters.

Your job? Use your lightning speed to scale ladders, scurry across girders, climb ropes and race through 30 levels to defuse the bombs before they go off.

That's the kind of hot, non-stop action we've packed into the award-winning,* best-selling Jumpman,™ and into Jumpman Jr.,™ our new cartridge version with 12 all-new, different and exciting screens.

Both games force you to make tough choices. Should you avoid that Alienator, climb to the top and try to work your way down, or try to hurdle him and defuse the bombs closest to you before they go off?

If you move fast you'll earn extra lives. But if you're not careful, it's a long way down.

So jump to it. And find out why Jumpman and Jumpman Jr. are on a level all their own.

One to four players; 8 speeds; joystick control. Jumpman has 30 screens. Jumpman Jr. has 12 screens.

EPYX COMPUTER SOFTWARE

STRATEGY GAMES FOR THE ACTION-GAME PLAYER.

*1983 C.E.S. award winner.

Modern Memory: The Future Of Storage Devices

Selby Bateman, Assistant Editor, Features

Big business is already using microfloppies, Winchester discs, and laser technology for data storage. As some of these innovations filter down to the home computer market, your tape recorder could become as obsolete as a paper tape punch.

Linda Helgerson was up to her ears in floppy discs. Something had to be done. Three or four hundred of the 5¼-inch discs were stored in her home—row upon row of mailing lists, bibliographical data, and spreadsheet analyses.

"I just didn't have enough storage. My mailing list itself was on five floppies that had to be merged," says Helgerson. "There's just no way I could manage that amount of data using floppies."

After a careful study of her needs, she purchased a 10-megabyte hard disc drive. The result has been dramatic. Since she put her mailing list on the hard disc system, she has added another 6000 names, and there's still plenty of room to spare.

Mass Storage Isn't For Everyone

As head of her own northern Virginia consulting company, which is run out of her home, Helgerson admittedly has extraordinary storage needs. The two TRS-80 Model 3 computers which serve her business, Quarry Hill, Inc., also double as teaching tools, game machines, and word processors for her two teenage daughters.

Helgerson is one of a growing minority of personal computer users who are finding that their needs are not met by minifloppy disc or cassette tape storage systems. Newer, faster, larger-capacity storage devices aren't yet available for home computer users. But industry observers are seeing the first real stirrings of interest in those products among the more adventurous home computer owners.

Whether you need a different storage system now or not, it's worth knowing about *perpendicular recording, microfloppy discs, interactive videodiscs,* and *Winchester disc drives.* They'll be increasingly important to future home computing.

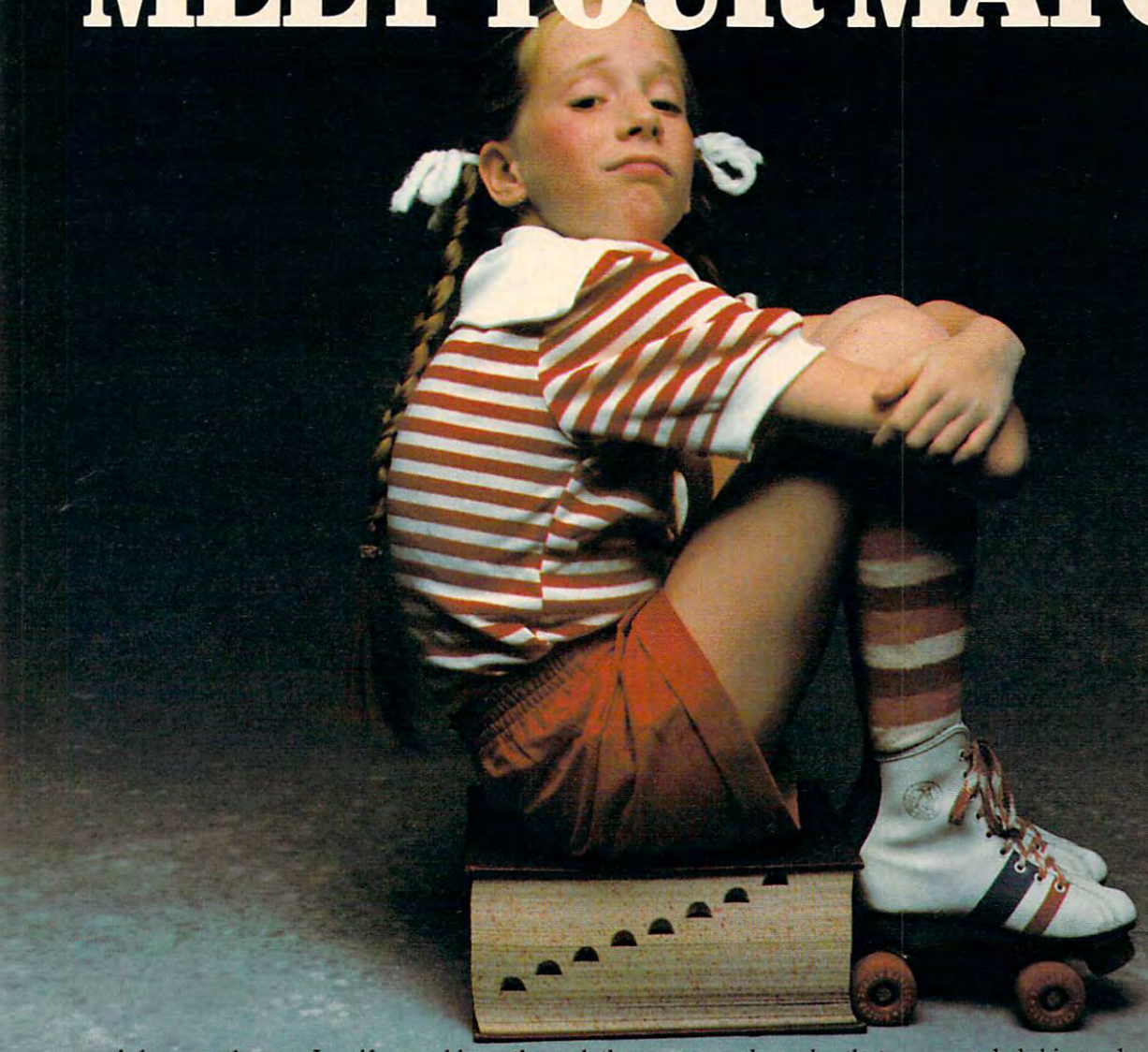
First, The Bad News

For those who have mass storage needs like Linda Helgerson's or who are dedicated computer hackers itching to use the latest technological innovations, there is some bad news and some good news.

The bad news, says Jim Porter, editor of the respected annual market study *Disk/Trend Report,* is that advances like microfloppy discs and inexpensive hard discs for the home market are at best several years away. And even then, Porter is doubtful there will be a large enough body of computer users who will want the products.

The good news, he adds, is that somebody

NOAH WEBSTER, MEET YOUR MATCH.



A few months ago, Jennifer would rather have gone to the dentist than do her spelling homework.

Then Mom bought Crypto Cube™ by DesignWare.™ Now Jennifer has become a word fiend. In fact, she spends hours paging through the dictionary to find words that will stump her parents. And, as she does, she builds her word skills.

Crypto Cube, like all DesignWare software products, combine computer game fun with sound educational principles.

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Five minutes after Jennifer sat down at the computer with Crypto Cube, she was hooked. First she worked her way through the many word puzzles that come with the game. Then her parents typed her spelling homework into new puzzles.

Then Jennifer started making puzzles for her parents!

So now, Crypto Cube is the favorite family game in Jennifer's home.

As Jennifer would say, "indubitably."

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Another word game, Spellicopter,™ is an action-packed spelling game. You'll fly perilous missions through crowded skies and mountainous terrain to rescue words. And you'll want to keep an eye out for our new math and science games. See your local dealer or call DesignWare at (800) 572-7767, in California (415) 546-1866 for our free software catalog. You'll be delighted with the way your kids will learn with DesignWare.

And they'll be playing for the fun of it.

DesignWare™

LEARNING COMES ALIVE

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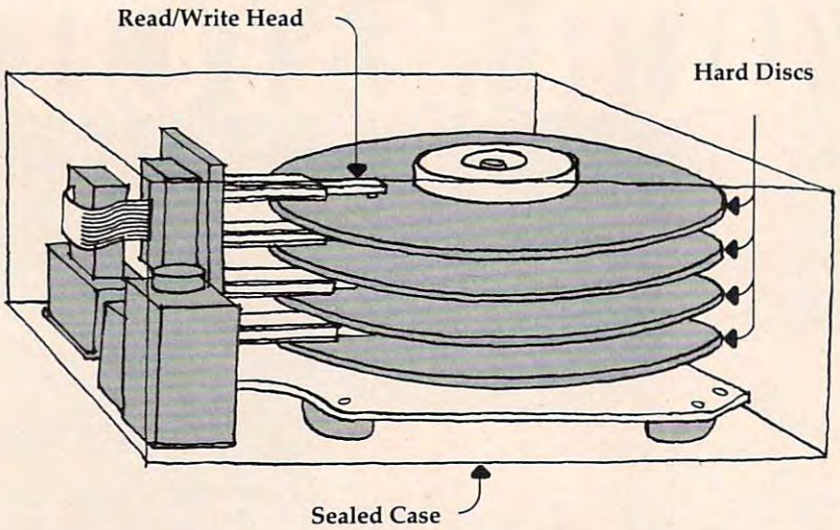
Figure 1: A Hard-Disc Drive



somewhere is probably working right now on the product you want. "I really think in the small computer area almost every whim will be responded to. And if something has a following there, then the response will be fairly prompt. I've seen it over and over again. It's hard to see how any niche will not be checked out."

Before we look at some of the most important trends in storage, consider where 99 percent of us are today.

Tape Or Disc Most Common

Virtually all home computer users now have either a tape drive system or a floppy disc drive. Both of these devices use a magnetic coating that records the electronic signal from a computer. When you tell the computer to store something on either tape or disc, it writes on the magnetic medium by magnetizing small areas in a form of binary notation, magnetic ones and zeros. Once these areas are magnetized, they have a self-locking mechanism which preserves the integrity of the stored information.

As computer owners quickly find out, a tape recorder is the least expensive memory storage device. But what you save in money you pay for in time. In order to find something, the tape must physically pass in front of the stationary read-write head so the recorder can check each byte of data, in a sequential search.

Computer users did not relish waiting while the tape drive did its work, and that led to the introduction of disc drives for home use.

First developed by IBM in 1965 in an 8-inch format, then adapted by Shugart in 1976 to the familiar 5¼-inch size, floppy discs have quickly become the medium of choice for microcomputer data storage. The floppy disc (or diskette) is a random access device, in which both the read/write head and the disc move. In its protective paper sleeve, the disc is inserted into a disc drive, where it spins at about 300 revolutions per minute while the head seeks out the requested information anywhere on the surface of the disc.

Hard Choices

A typical 5¼-inch minifloppy disc might contain as much as 350–400K (kilobytes, or 358,400–409,600 characters) if the tracks on which information is stored are on both sides of the disc and densely packed. Many 5¼-inch discs are single-sided, single-density, and hold about half that much.

Compare that to the hard disc drive, often called a Winchester drive, which Linda Helgerson purchased. Storage capacity for that drive is 10Mb (10 megabytes, more than 10 million characters) of data.

Hard disc drives cost more (Helgerson's was close to $2000) and have been used almost exclusively in business settings, where large quantities of information must be stored and retrieved quickly. As their name implies, hard discs are rigid. They are made of aluminum (also in 8-inch and 5¼-inch sizes) and are permanently sealed inside a case. Although some hard discs can be removed from the drive, most cannot. The hard disc spins at faster speeds (usually 3600 rpm) than a floppy, and the read/write head actually floats just above the disc rather than directly contacting it as with floppies. Hard discs also have faster access times.

More Interest Than Need

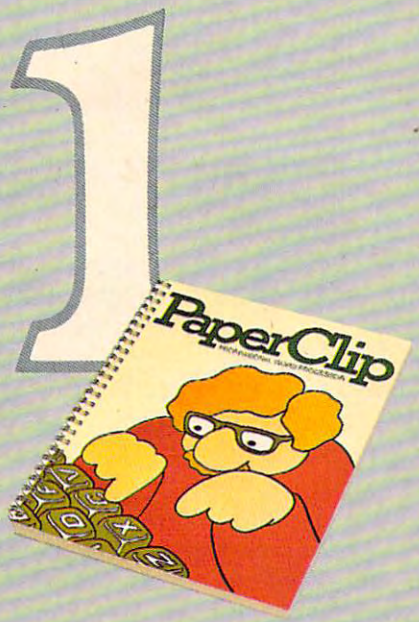
Why not use a hard disc for your home computer?

"We've had more than just casual inquiries about hard discs for the Atari 800," says Bob Gerwer, vice president of marketing for Percom Data of Dallas, Texas. "The people who originally bought the 800 were genuine hackers. And the ones who bought it for four or five hundred bucks have got a lot invested in it. Now, some of those people are interested in hard discs."

Kevin Burr, director of communications for Shugart, a company that has been a leader in the original equipment manufacturing (OEM) industry, reports that his organization has also seen some limited interest in hard disc drives for the home market.

"But it's not a dramatic increase of interest,"

YOUR 3 BEST REASONS TO OWN A COMMODORE 64™



The best word processing program of its kind

PaperClip* is the program that makes word processing so simple you'll never use a typewriter again. Advanced features you might only expect on a much more expensive system, yet so easy to use even a novice can get professional results.

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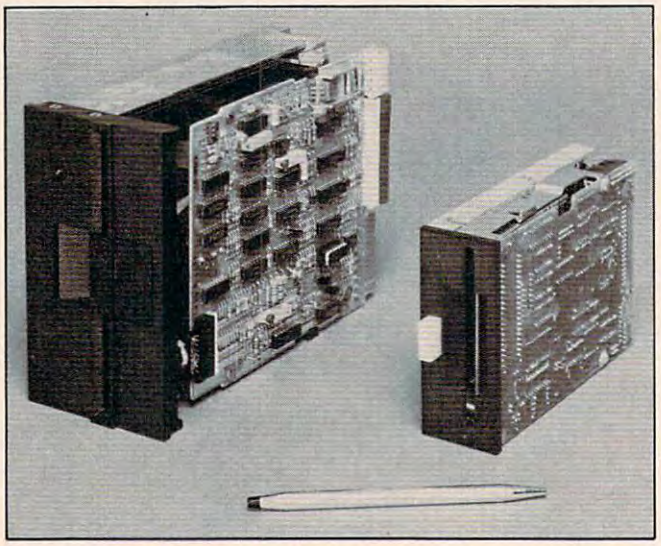
BATTERIES INCLUDED

*PaperClip, Delphi's Oracle and BusCard have been developed specifically for Commodore computers by Batteries Included. For a full-color brochure on all 3 of these packages, write to Batteries Included, 186 Queen St. W., Toronto, Ontario, Canada M5V 1Z1, or call (416) 596-1405.

he cautions. "A home user typically does not need that kind of capacity. I think it's more of a novelty rather than a strong need from those users."

Hard Discs More Delicate

At the Tandon Corporation, which during 1983 reportedly had about a 60 percent market share of the $4.3 million 5¼-inch floppy disc drive industry, marketing manager Bob Abraham concurs with Burr about the immediate future of hard discs in the home.



Shugart's 3½-inch SA300 (right) is a single-sided microfloppy drive offering 500K bytes of capacity. It is compatible with the standard 5¼-inch minifloppy disc drives.

"The hard disc just doesn't lend itself to the home environment. I think the industry as a whole has to learn and to educate the user about the care and feeding and handling of hard disc systems. It's really a very different ball game."

One of the problems with a hard disc system for home use is that since the head floats just above the disc, it jars easily and is susceptible to crashes. When a floating head is only .0001 of an inch from a disc, a human hair takes on the dimensions of a felled sequoia. Even a puff of smoke could cause a head crash.

"I guess I would have to say that in the long term, there will be ruggedness built-in. The drives will be well-protected and shock-mounted," says Abraham. "And to a large extent, there will be a greater degree of user education. People will just learn that they'll have to be a little more careful with those kinds of things."

Microfloppies For The Home

While industry observers are less than optimistic about the future of hard discs in the home, that is not the case for the microfloppy disc.

"There's a great deal of movement in the industry toward smaller devices that won't sacrifice performance," says Tandon's Abraham.

Adds Shugart's Kevin Burr, "The home market is going to be the key audience for the microfloppy. That's why it was developed."

Microfloppies, floppy discs either 3, 3¼, or 3½ inches in diameter, have been a hotly debated topic in the microcomputer industry for several years. Disagreements center not on whether microfloppies are a good idea, but on what size should be standard. The question is still open, but the 3½-inch microdisc appears to have an edge.

A Standard Is Emerging

"We feel the standard has now been reached, particularly with the recent signing of Apple and Gavilan in a 3½-inch format," says Burr. "And IBM is rumored to be following suit.

"It is probably already the de facto standard in terms of volume and production. Shugart and Sony are the only two manufacturers currently shipping products in volume. We have a lot more products out there than anybody else."

By the end of 1983, Shugart alone expects to have shipped about 10,000 microfloppy products.

Several Advantages

There are several reasons why microdiscs are attractive for home computer data storage. Because of the ability to pack data magnetically in a more compact area, microfloppies can already equal the storage capacities of 5¼-inch or even 8-inch discs. They are less susceptible to temperature and humidity changes and, when packaged in hard plastic-and-metal casings, are less prone to damage. They are particularly suited for use in portable computers where space is at a premium.

While the question of a standard size and available software for the microdiscs may hold back development slightly, there is every indication that microdiscs are on the way to the home. But how soon?

"There will be only a gradual build-up in the total number of microfloppies shipped," cautions industry analyst Jim Porter. "And as for their use with the home computer, for the next several years microfloppy drives are not likely to be lower in cost than equivalent quantities of minifloppy drives."

Vertical Recording Devices

Advances in magnetic media technology will also help to prepare the way for microfloppies. One of the most promising new developments is in perpendicular, or vertical, recording.

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proponents of vertical recording maintain that products will be on the market within the next year, how soon can owners of home computers expect to find them in stores?

"You're not likely to see perpendicular recording used in products in the home for quite a while," says Jim Porter. "It's probable that flexible disc drives using perpendicular recordings will be shipped by early 1985 in limited quantities. But they'll be the furthest thing from mainstream. There will not be many producers, and the technology is likely to be fussy for quite a while. It probably will end up mainstream, but I think you should be thinking in terms of the end of the decade."

One of the leaders in vertical recording is the Minnesota-based firm, Vertimag Systems. Later this year, the company plans to market a vertical recording system with over six and a half megabytes per 5¼-inch disc. "We're just at the beginning of this technology," says a Vertimag spokesperson. "Just imagine what it will be five or ten years from now."

Although there are very few American companies in the perpendicular recording field, the Toshiba Corporation of Japan is expected to market a vertical recording system, probably sometime in 1985.

An Interactive Dragon On Videodisc

Last year while on a trip, Kent Wood, who directs the Videodisc Innovations Project at Utah State University, glanced into a videogame arcade and saw most of the machines deserted. Around one of the consoles, however, stood a crowd of people watching a new game called *Dragon's Lair*. With color video quality far superior to the surrounding games, *Dragon's Lair* offered 38 short action-adventure scenes with a total of 200 different decisions confronting the player before victory could be achieved.

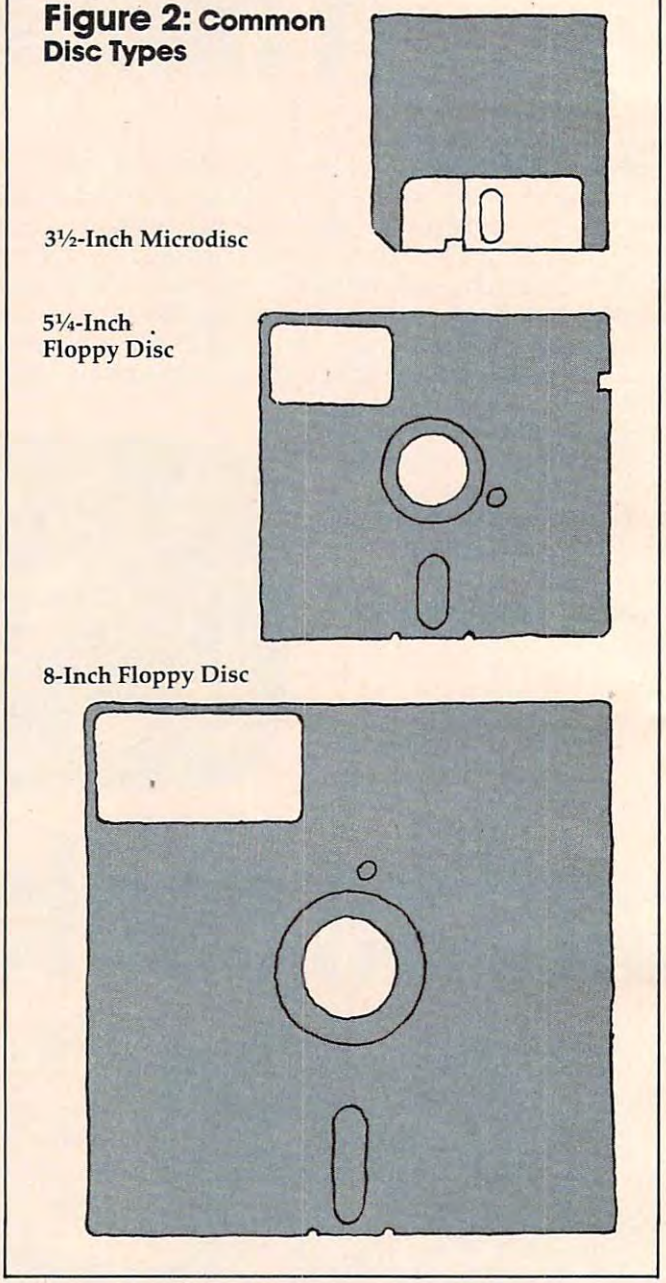
The crowd around the machine that day didn't surprise Wood. The colorful animated game is based on a Pioneer PR-7820 interactive videodisc system. About 14 minutes of the 30-minute capacity of *Dragon's Lair* is interactive. That is, decisions that a player makes cause the laser beam that reads data off the disc to jump to different positions on the disc itself.

Wood doesn't believe he saw just a crowd around a game machine that day. He believes he saw the future. The next step will be low-cost videodisc systems that will be brought into homes as peripherals for personal computers as well as part of overall home information and entertainment centers.

But first, he says, people must have a greater understanding of the possibilities.

"As the level of sophistication increases in the home market about the potential of interactive video, it will overcome the people limitation. When we compare 1984 with what we had when we started in 1977 and 1978, the technology has advanced remarkably. And it will continue, though not quite as fast."

Figure 2: Common Disc Types



Reading The Pits

One of the most promising forms of videodisc technology is optical recording. A laser writes on the disc by burning tiny pits into the surface. A second laser then reads the pits. No head comes in contact with the disc, so wear is reduced. And videodiscs can hold immense amounts of information, say, 4000 megabytes (4 gigabytes, more than 4 billion bytes). An entire set of encyclopedias can be put on a videodisc.

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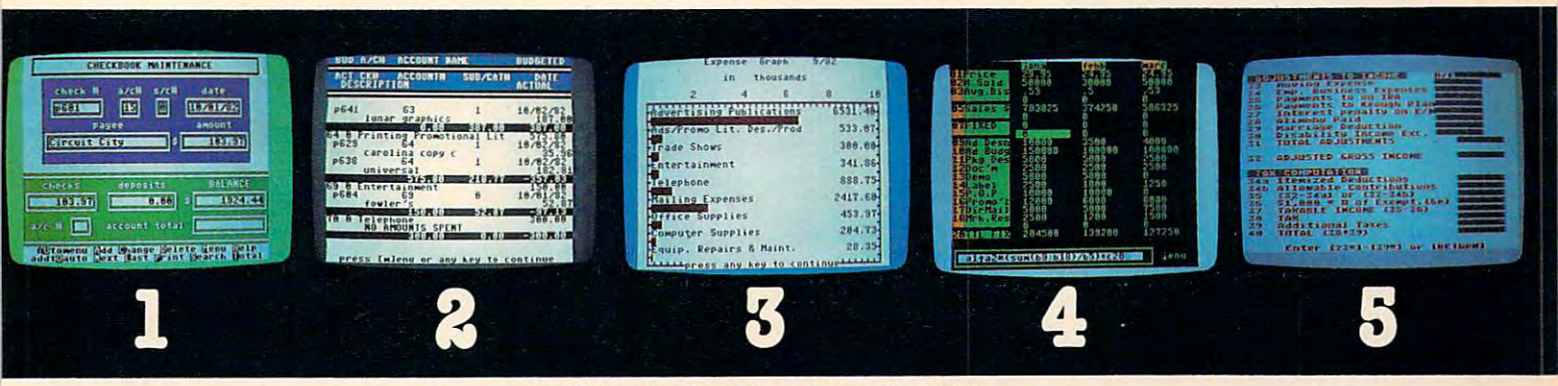

actual screen display *indicates function being shown

Chart of Accounts
*Checkbook Maintenance
Check Search
Prints Checks

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

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But to be truly interactive, a videodisc must be able to withstand repeated rewritings, just as magnetic disks do. In burning a pit into the surface of a videodisc, however, the laser eats away some of the material.

Magneto-opticals is one of the possible solutions.

Erasing With A Laser

In magneto-opticals, the laser is used to heat a special coating until it reaches the Curie point (named for Madame Curie), the temperature at which magnetic materials revert to a neutral magnetic orientation. Information is added or erased in this manner. A second, weaker laser, using a polarized filter, then reads the materials. Wedding the laser to magnetic media in this way means vastly reduced wear on the videodisc and allows repeated rewritings.

"It's a strange kind of marriage between optical technology and magnetic technology," says Porter. "Many companies have been working in the area, such as IBM, Phillips, Xerox, and several Japanese companies."

While magneto-opticals and another laser-writing experiment called *phase-change* have been demonstrated in the laboratory, Porter says there are quite a few difficulties in making them producible. Commercial products using either technology are at least several years away.

Videodisc For The Commodore 64

Videodisc systems are being used on a growing basis with computers for job training, education, and data base archives. There are a number of compatible systems currently being marketed, but they can be expensive.

For owners of Commodore 64 computers who want to go interactive, Micro-Ed, Incorporated of Minnesota offers a product called Lasersoft, an interactive videodisc microcomputer instructional system aimed at the low-end market.

The system is designed to work with a Commodore 64 with 1541 disc drive, a color monitor, Pioneer 8210 videodisc player, and the Micro-Ed controller box, which links the computer and the videodisc player. The company plans to make the controller box available for other computers as well.

Marketed at under $200, the controller box enables the computer to access at random any of the thousands of frames on the videodisc and present them on the monitor. (Micro-Ed, Incorporated, P.O. Box 444005, Eden Prairie, MN 55344, (612) 944-8750.)

LaserDisc Interface For Apple

Another company, Anthro-Digital, Inc., offers a $275 Omniscan LaserDisc interface which connects an Apple computer to a Pioneer, Sylvania, or Magnavox LaserDisc. Omniscan allows the computer to duplicate the functions of the videodisc control panel, but under programmed control. (Anthro-Digital, Inc., P.O. Box 1385, Pittsfield, MA 01202, (413) 448-8278.)

Judith Paris, who edits the quarterly trade publication *Videodisc/Videotex*, believes that the increase in use of videodisc players as microcomputer peripherals depends on the availability of inexpensive generic interfaces and software to control the videodisc player.

Anthro-Digital, Inc.'s Omniscan LaserDisc interface for use with an Apple computer and appropriate videodisc systems.

She estimates that by the end of the 1980s, government agencies and the armed forces will often be using interactive video systems for archival purposes and training devices. Increasingly, large companies are moving to more sophisticated use of integrated information systems with interactive video.

A Solid Market Base

"The videodisc industry is still in search of its identity," says Paris. "But the fact that government is pushing it, and that business systems are developing a lot of uses that will have an impact on home use, means that it will really start coming into its place."

Jim Porter agrees. "There are companies putting together hardware using videodiscs and computers for business to make data bases, store digitalized material for character-by-character retrieval, and sometimes for the creation of im-

ages. These include a lot of training areas and management functions.

"I really doubt that there's much real demand to have, say, the *Encyclopaedia Britannica* available on your personal computer. It's going to take a lot of experimentation and entrepreneurial effort to find out just what people will want to buy."

A Cloudy Crystal Ball?

In forecasting computer industry trends, the future must often be measured in months, not years or decades. That can turn even the best crystal ball cloudy. As Porter notes, in the free-market competition of the microcomputer field, anything can happen.

"So-called predictive research is usually not worth the powder to blow it up," he says. "When someone is asked to put up money to buy some specific thing and then that individual establishes his own priorities as to where he's going to spend his money, that's a lot different from saying 'Would you like to have....?' in a questionnaire."

Personal computer owners should have plenty of opportunity to show what they do and don't want in the field of mass storage devices, he concludes. "There are literally hundreds of small operations out there that will do these things. And if they've got what people want, it'll blossom." ©

Coleco's Adam:
A Hands-On Report

Selby Bateman, Assistant Editor, Features
Tom R. Halfhill, Features Editor

Coleco's long-awaited Adam, first promised for delivery early last fall, began appearing on retail shelves in limited quantities by mid-October. The company is counting on a combination of low price (initially $600, now $700) and attractively bundled hardware/software to capture a significant segment of the home computer market this year. Here's a hands-on look at Coleco's entry into this crowded field.

Since its first appearance at the 1983 Summer Consumer Electronics Show in Chicago, Coleco's Adam has stirred great curiosity among consumers and has forced competitors to change some of their marketing strategies. Suddenly, bundled seemed better. The Adam's grouping of computer, detached keyboard, daisy wheel printer, high-speed cassette drive, joysticks, and software prompted announcements of similar packaging options from Commodore, Atari, and others almost overnight.

Coleco launched the Adam with a multimillion-dollar advertising campaign, including TV commercials and lavish color ads in leading magazines. Unfortunately, the Adam was never shipped in sufficient quantities to satisfy demand before Christmas. A few retail chains reportedly backed away from planned Christmas ads for the Adam because of the delayed deliveries.

Since then, Coleco has run up against quality-control problems and bugs in early production models. One major department store chain, J. C. Penney, announced in December it was not carrying the Adam because of problems with quality control. We'll get to this in a minute.

The System Approach

There are two functionally identical versions of the Adam. You can buy the whole system from scratch for about $700, or get an expansion package for about $500 that converts a ColecoVision videogame machine into an Adam. Thousands of ColecoVision owners may be predisposed to buy an Adam instead of another home computer. The Adam even runs all the ColecoVision game cartridges.

When you buy an Adam, getting it home is a challenge because everything comes packed in one huge box that barely fits into today's economy cars. Inside the box is the Memory Console, a low, rectangular enclosure which contains the Central Processing Unit (CPU) and the Digital Data Drive (a high-speed cassette recorder); a 75-key, full-stroke, detachable, typewriter-style keyboard; a letter-quality daisy wheel printer; two joystick controllers with built-in numeric keypads and coiled cords; enough cables to hook everything together; three digital data packs (cassettes); plus three manuals and two reference guides.

Two of the data packs are prerecorded: One contains *SmartBASIC*, the Adam's standard programming language; and the other is *Buck Rogers Planet of Zoom*, an arcade game. The third data pack is a preformatted blank tape. Besides this software, the Adam itself contains a built-in word processing program, SmartWriter. Accompanying booklets include *Getting Started: Adam Set-Up Manual* (64 pages); *Programming With Adam: A Simple Guide to SmartBASIC* (222 pages); *Typing With Adam: Using Easy-to-Learn SmartWriter Word Proc-*

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essing (101 pages); *Adam SmartWriter Easy Reference Guide*; and *Adam Super Game Pack* (instructions for the arcade game).

As the advertisements promise, you get a complete computer system that is ready to run and do something useful when you first get it home. That fact, plus the attractive package price, may well be Coleco's strongest selling point—competitors require you to add some extras separately.

The alternative "separate components" approach to building a home computer system would allow more freedom to choose certain peripherals and software, since you can buy compatible products from independent manufacturers. If assembled correctly, the resulting system may well outperform a comparable system made up of a single manufacturer's components. On the other hand, there are many products available, and compatibility can be hard to ascertain. Many people (especially beginners) feel more comfortable buying a prepackaged system. The Coleco Adam is aimed at the latter market.

The Coleco Adam comes with everything shown here, plus software and manuals. manuals.

Adam's Features

For the money, the Adam's features look impressive. It comes with 80K of Random Access Memory (RAM), which Coleco says will be expandable to 144K in the future. A Texas Instruments sound chip and a TI graphics chip endow the Adam with three sound channels, 16 colors, and 32 sprites (programmable screen objects for animation). The Memory Console has three internal expansion slots and one external expansion connector (although no expansion modules are yet available); a topside slot for ROM cartridges and ColecoVision games; connectors for the joysticks, printer, keyboard, TV, a monitor, and auxiliary video; and room for a second Data Drive (not yet available).

The keyboard is impressive, particularly given the system's price. The keys are sculpted Selectric-style and have a nice feel. Many keys are specially labeled to work with the built-in word processor. For instance, when the computer is first switched on you can boot up SmartWriter simply by pressing the ESCAPE/WP key in the upper-left corner. Other dedicated keys include MOVE/COPY, STORE/GET, PRINT, UNDO, WILD CARD, CLEAR, INSERT, and DELETE. In addition, there are six special function keys with preprogrammed functions for SmartWriter. Four independent cursor keys are arranged in a convenient diamond pattern around a HOME key. Lightweight and fairly flat, the keyboard can rest in your lap while connected with its coiled phone cord to the Memory Module. A plastic attachment snaps onto the side of the keyboard to hold one of the joysticks.

The Coleco printer has been widely criticized as noisy and slow (ten characters per second is much faster than most people can type, but annoyingly tedious for a printer). However, you'll have to balance these debits against the much higher cost of buying a daisy wheel printer separately—most of them would cost as much as the whole Adam system.

The Adam's CPU is the widely used Z80A microprocessor chip. Z80-family chips (made by Zilog) are found in TRS-80, Epson, Timex/Sinclair, Osborne, Kaypro, and many other personal computers. An eight-bit chip, the Z80A cannot address more than 64K of memory at a time. Since the Adam has 80K (with room for another 64K), not all of this memory is contiguous. That is, anything above the maximum addressable 64K must be *bank-switched*, or flipped in and out as needed. Usually this is handled by the operating system for you. Other eight-bit computers overcome their 64K limits the same way (such as the Atari 1200XL and Commodore 64, which each have at least 80K of RAM and ROM).

One advantage of the Z80 over other chips is that it runs an operating system called CP/M (Control Program for Microcomputers), for which a large pool of mostly business-oriented software is available. This means the Adam may work with CP/M someday, although you would still need a way to obtain the software in a format the Adam could read (its data packs are not compatible with other storage media). A CP/M-compatible disk drive is in planning stages.

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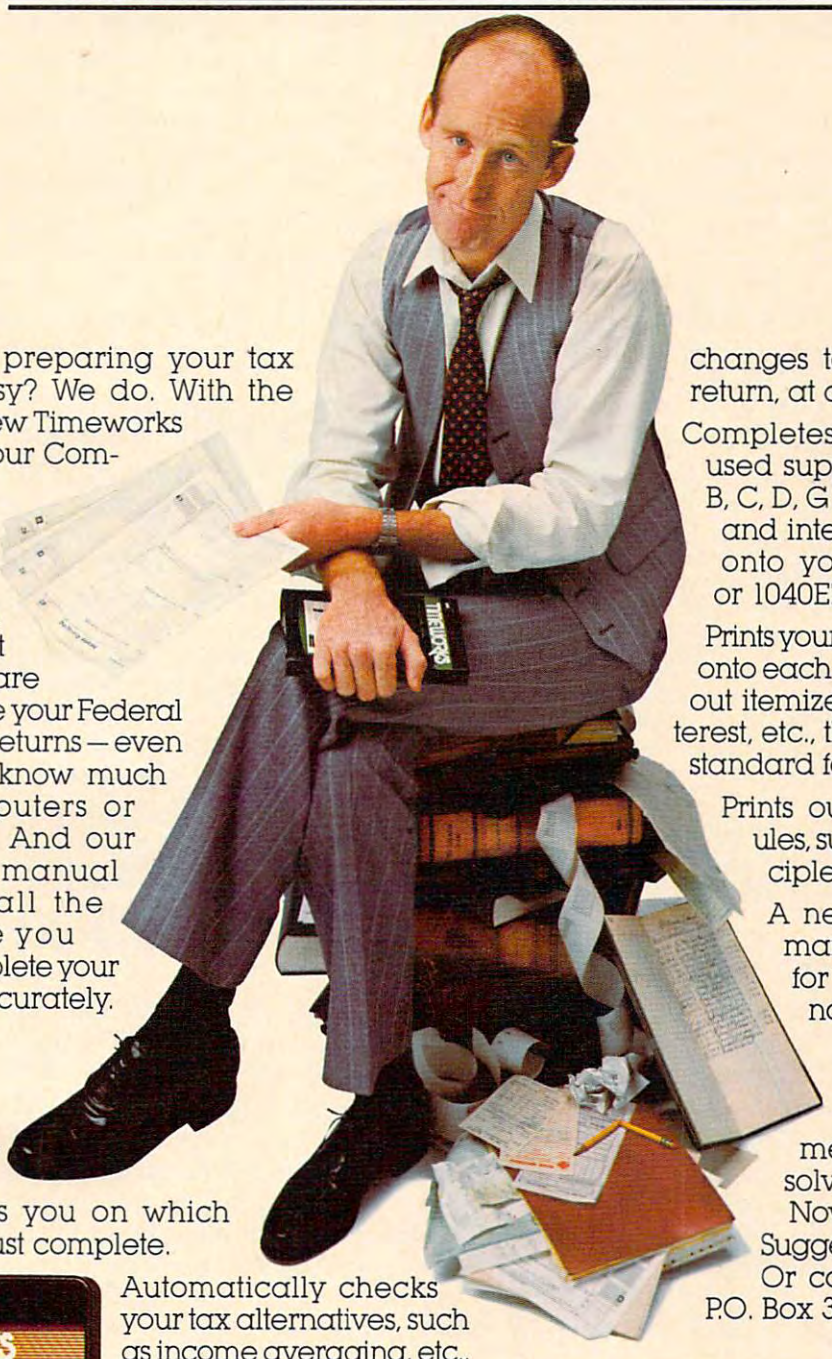

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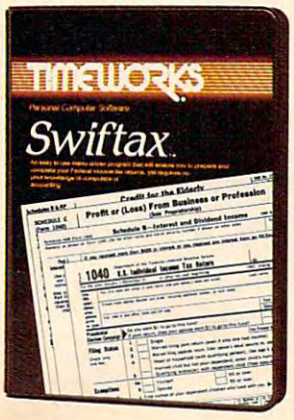

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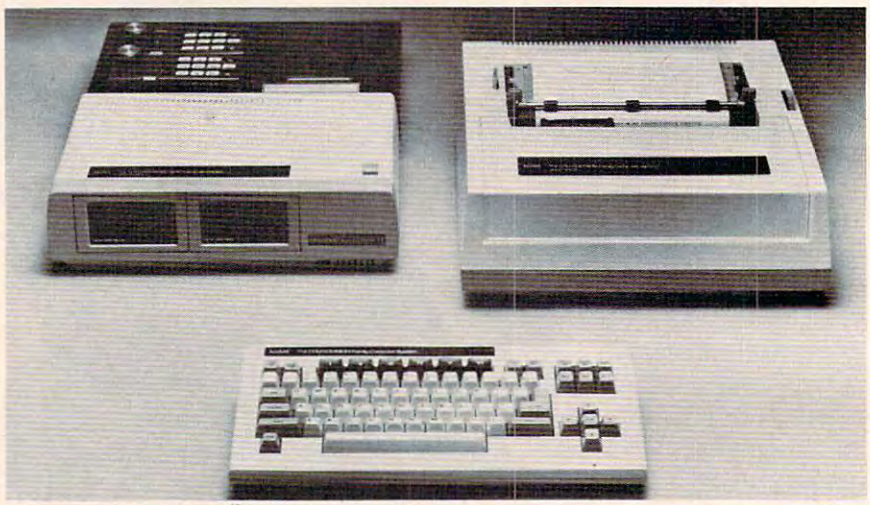
The data packs appear to be ordinary cassettes, but the plastic shells lack capstan holes and will not fit into a standard cassette recorder. The tape itself is a gamma ferric oxide formulation, similar to the tape in some good-quality audio cassettes. However, Coleco says ordinary audio cassettes will not work, and that blank data packs must be purchased from Coleco dealers for about $10. Coleco explains that the data packs are specially engineered for high-speed use, and that tape path accuracy is ten times better than with ordinary cassettes. Also, the data packs must be preformatted at the factory—they won't work unformatted.

Coleco compares its Digital Data Drive to the floppy disk drives commonly used with other computers. The digital drive *is* much faster than an ordinary cassette recorder, but is not quite as fast as most disk drives. Then again, most disk drives cost at least half as much as the entire Adam system.

The file directories for the data packs—analogous to disk directories—are located in the center of the tape to help speed up the searching and loading process.

Each data pack stores 500K (half a megabyte), or the equivalent of about 250 typed pages of text. This *does* compare favorably with disks, since most minifloppies store perhaps only ¼ that amount.



This version of the Adam converts the ColecoVision videogame machine into the computer system. It is functionally identical to the regular Adam.

Apple Compatible?

Another interesting feature of the Adam is its *SmartBASIC*. Most home computers have BASIC built into ROM, so it's ready instantly after power-up. Application programs, such as word processors, must be loaded from disk or tape.

Coleco took exactly the opposite approach with the Adam. SmartWriter is built into ROM, accessible with a keystroke after power-up, but *SmartBASIC* must be loaded from tape. This takes a couple of minutes. Coleco evidently figured that more Adam users will be interested in word processing than programming.

Coleco says *SmartBASIC* is designed to be compatible with Applesoft, the Apple II/IIe's Microsoft BASIC. This will be welcomed by people who already are familiar with Applesoft. Most of the *SmartBASIC* commands are the same. Since many school systems have Apples, Coleco obviously decided that an Applesoft-compatible BASIC would be an added attraction for purchasers with school-age children.

However, this does not mean you can simply load up an Apple program into the Adam and type RUN. For one thing, you'd have to manually type in the Applesoft listing, since Applesoft programs are not available on Coleco data packs. Also, remember that the Apple has a 6502 CPU instead of the Z80A and an entirely different memory layout. Therefore, Applesoft programs with PEEK, POKE, and CALL statements will not work on the Adam without extensive modifications. (Most Applesoft programs use numerous PEEKs, POKEs, and CALLs.)

SmartBASIC's Applesoft compabibility has another drawback, too. The Adam has advanced features not found on the Apple—such as three-channel sound and 32 sprites. *SmartBASIC*, patterned after Applesoft, does not, however, effectively support all these special features. Conspicuously missing are the many commands needed to manipulate sprites and play music.

Coleco also adopted an Apple-type, line-oriented screen editor. The INSERT, DELETE and cursor keys that are so handy with SmartWriter are of little use with *SmartBASIC*. When you mistype a character in a program line, the manual recommends retyping the entire line. Although you can move the cursor up to the typo and fix it on the screen, hitting RETURN wipes out the rest of the line.

Software, Hardware To Come

Aside from the software which comes bundled with the Adam, there isn't much else available—at least not yet. However, Coleco says it is working hard to remedy the situation. A company spokesman said that by early December agreements had already been worked out with such software producers as Spinnaker, Brøderbund, Sierra On-Line, and Infocom. Coleco is encouraging other inde-

pendent software publishers as well, and is preparing its own line of programs. Since all ColecoVision cartridges work on the Adam, of course, there is a good supply of game software.

The word processing software built into the Adam is menu-driven and easy to use, although a bit sluggish for fast touch-typists. Margins and column positions are shown at the top of the screen. The letters appear on a black line at the bottom of the screen as you type. They shift above that line when more words are typed. The word processor can also be used in an "electronic typewriter mode" (each keystroke triggers the printer to type one character).

Besides lining up additional software, Coleco also is readying some more hardware. A Coleco spokesman says that, with an expansion module costing about $70, the Adam will accept videogame cartridges designed for the Atari 2600 VCS game machine. To add a second Data Drive, it would cost about $150. Other planned options include a CP/M compatible disk drive (about $350), a memory expansion card (under $200), a ROM cartridge (about $30), a telephone modem (about $125), and an RS-232-C serial interface (approximately $50).

Quality And Availability

As mentioned, there has been considerable speculation about the quality of the Adam. Partly this is due to skepticism over how Coleco can assemble a complete system for such a low price. Coleco staunchly denies that the Adam's failure rates are greater than any other home computer's. The company maintains that initial failure rates were under ten percent, and that many of those were caused by customer misuse.

However, consistent problems have been reported, both by users and by the industry press. COMPUTE! encountered one of these problems, which reportedly afflicts thousands of new Adam owners (including other magazines doing test reports). After working with the system for several days, we suddenly found that the *SmartBASIC* tape would no longer load. It turns out that switching on the Adam generates a strong magnetic field, strong enough to erase a data pack sitting near the computer or even in the Data Drive. Since there is no way to back up *SmartBASIC* (or any other data pack) without two Data Drives, users can be left without a BASIC language.

To solve this problem, Coleco is making replacement tapes available to those who call the company's toll-free number (1-800-842-1225). Also, Coleco is adding a notice to the manual and a sticker to the computer warning new users about the hazard.

As for the Adam's printer, it's obviously not intended for heavy use. One unusual feature we noticed is that the power switch for the entire Adam system is on the printer, not the computer; if the printer does break down someday, the computer cannot be turned on until the printer returns from the repair shop.

Regarding availability, Coleco says it plans to increase shipments to 150,000 units a month during the first quarter of 1984. The Adam is being marketed through major retail chains and is still being heavily advertised. It's still too early to tell if the recent price increase will significantly affect sales. (The increase boosted the wholesale cost from $525 to $650; retailers are free to charge what they like since Coleco does not suggest a retail price.)

It's also too early to tell which competitor, if any, will be hurt most by the Adam. The Adam still costs less than a Commodore or Atari equipped with a disk drive and dot-matrix printer, and costs much less than a fully configured IBM PCjr or Apple IIe.

The Adam's main impact may well be to change the way manufacturers approach the home computer market. As more and more neophytes take the plunge into home computing, there could be greater demand for bundled packages which take the guesswork (and expense) out of piecing together a workable, useful, personal computer system. ©

The Automatic Proofreader

For VIC, 64, And Atari

Charles Brannon, Program Editor

At last there's a way for your computer to help you check your typing. "The Automatic Proofreader" will make entering programs faster, easier, and more accurate.

We all know it's hard to type in a program correctly the first time. Seemingly trivial typing errors can cause dreaded ERROR messages, or even a *system crash* (the keyboard will not respond to RUN/STOP—RESTORE or BREAK keys). Usually, the only way to recover from such a crash is to reset the computer by turning it off, then on again—wiping out the memory (and all your typing) in the process.

Even when you locate and correct the mistyped lines, there always seem to be more, lurking in the hundred-odd lines of the program. Sometimes you feel like giving up.

Elusive Errors

Some errors are almost impossible to spot, especially for beginners who know little or nothing about programming. For instance, can you spot the mistake in this line?

```
100 C=C+LEN(STR$(VAL(L$))+1
```

Here's how it should read:

```
100 C=C+LEN(STR$(VAL(L$)))+1
```

Did you catch the difference? A right parenthesis was missing before the +1. (A left parenthesis must always have a matching right parenthesis. If you add up all the parentheses in a statement, you should get an even number.)

An Impossible Dream?

The strong point of computers is that they excel at tedious, exacting tasks. So why not get your computer to check your typing for you?

With "The Automatic Proofreader" nestled in your VIC-20, Commodore 64, or Atari computer, every line you type in will be verified. It displays a special code, called a *checksum*, at the top of the screen. The checksum, either a number (VIC/64) or a pair of letters (Atari), corresponds to the line you've just typed. It represents every character in the line summed together. A matching code in the program listing lets you compare it to the checksum which the Proofreader displays. A glance is all it takes to confirm that you've typed the line correctly.

The Automatic Proofreader is a small machine language program that resides in a normally unused area of memory. On the Atari, the program is stored in Page 6 ($0600), where it will safely remain until you turn your machine off, or run another program that uses Page 6. The Proofreader goes into the cassette buffer on the VIC and 64. Putting the Proofreader here does not use any of your BASIC program memory, but it can cause problems, which we'll cover a little later.

Entering The Automatic Proofreader

Commodore (VIC/64) owners should type in Program 1. Program 2 is for Atari users. Since the Proofreader is a machine language program, be especially diligent. Watch out for typing extra commas, or a letter O for a zero, and check every number carefully. If you make a mistake when typing in the DATA statements, you'll get the message "Error in DATA statements" when you RUN the program. Check your typing and try again.

When you've typed in The Automatic Proofreader, SAVE it to tape or disk at least twice *before running it for the first time.* If you mistype the Proofreader, it may cause a system crash when you first run it. By SAVEing a copy beforehand, you can reLOAD it and hunt for your error. Also, you'll want a backup copy of the Proofreader because

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you'll use it again and again—every time you enter a program from COMPUTE!.

When you RUN the Proofreader, the program will be POKEd safely into memory, then it will activate itself. If you ever need to reactivate it (RUN/STOP—RESTORE or SYSTEM RESET will disable it), just enter the command SYS 886 (VIC/64) or PRINT USR(1536) for the Atari.

Using The Proofreader

Now, let's see how it works. LIST the Proofreader program, move the cursor up to one of the lines, and press RETURN. If you've entered the Proofreader correctly, a checksum will appear in the top-left corner of your screen.

Try making a change in the line and hit RETURN. Notice that the checksum has changed. All VIC and 64 listings in COMPUTE! now have a number appended to the end of each line, for example, :rem 123. *Don't enter this statement.* It is just for your information. The rem is used to make the number harmless if someone does type it in. It will, however, use up memory if you enter it, and it will cause the checksum displayed at the top of the screen to be different, even if you entered the rest of the line correctly.

The Atari checksum is found immediately to the left of each line number. This makes it impossible to type in the checksum accidentally, since a program line must start with a number.

Just type in each line (without the printed checksum), and check the checksum displayed at the top of the screen against the checksum in the listing. If they match, go on to the next line. If they don't, there's a mistake. You can correct the line immediately, instead of waiting to find the error when you RUN the program.

The Proofreader is not picky with spaces. It will not notice extra spaces or missing ones. This is for your convenience, since spacing is generally not important. Occasionally proper spacing is important, but the article describing the program will warn you to be careful in these cases.

Nobody's Perfect

Although the Proofreader is an important aid, there are a few things to watch out for. If you enter a line by using abbreviations for commands, the checksum will not match up. This is because the Proofreader is very literal: It looks at the individual letters in a line, not at tokens such as PRINT. There is a way to make the Proofreader check such a line. After entering the line, LIST it. This makes the computer spell out the abbreviations. Then move the cursor up to the line and press RETURN. It should now match the checksum. You can check whole groups of lines this way. Atari users should beware of using ? as an abbreviation for PRINT—they're not the same thing in the Proofreader's eyes.

The checksum is a sum of the ASCII values of the characters in a line. VIC and 64 owners may wonder why the numbers are so small, never exceeding 255. This is because the addition is done only in eight bits. A result over 255 will roll over past zero, like an odometer past 99999. On the Atari, the number is turned into two letters, both for increased convenience and to make the Proofreader shorter. For the curious, the letters correspond to the values of the left and right nybbles added to 33 (to offset them into the alphabet). This number is then stored directly into screen memory.

Due to the nature of a checksum, the Proofreader will not catch all errors. Since 1+3+5=3+1+5, the Proofreader cannot catch errors of transposition. In fact, you could type in the line in any order, and the Proofreader wouldn't notice. Anytime the Proofreader seems to act strange, keep this in mind. Since the ASCII values of the number 18 (49+56) and 63 (54+51) both equal 105, these numbers are equal according to the Proofreader. There really is no simple way to catch these kinds of errors. Fortunately, the Proofreader will catch the majority of the typing mistakes most people make.

If you want the Proofreader out of your way, just press SYSTEM RESET or RUN/STOP—RESTORE. If you need it again, enter SYS 828 (VIC/64) or PRINT USR(1536) (Atari). You must disable the Proofreader before doing any tape operations on the VIC or 64.

Hidden Perils

The Proofreader's home in the VIC and 64 is not a very safe haven. Since the cassette buffer is wiped out during tape operations, you need to disable the Proofreader with RUN/STOP—RESTORE before you SAVE your program. This applies only to tape use. Disk users or Atari owners have nothing to worry about.

Not so for VIC and 64 owners with tape drives. What if you type in a program in several sittings? The next day, you come to your computer, LOAD and RUN the Proofreader, then try to LOAD the partially completed program so you can add to it. But since the Proofreader is trying to hide in the cassette buffer, it is wiped out!

What you need is a way to LOAD the Proofreader after you've LOADed the partial program. The problem is, a tape load to the buffer destroys what it's supposed to load.

After you've typed in and RUN the Proofreader, enter the following lines in direct mode (without line numbers) *exactly* as shown:

```
A$="PROOFREADER.T": B$="{10 SPACES}": FOR
   X = 1 TO 4: A$=A$+B$: NEXTX

FOR X = 886 TO 1018: A$=A$+CHR$(PEEK(X)):
   NEXTX
```

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```
OPEN 1,1,1,A$:CLOSE1
```

After you enter the last line, you will be asked to press record and play on your cassette recorder. Put this program at the beginning of a new tape. This gives you a new way to load the Proofreader. Anytime you want to bring the Proofreader into memory without disturbing anything else, put the cassette in the tape drive, rewind, and enter:

```
OPEN1:CLOSE1
```

You can now start the Proofreader by typing SYS 886. To test this, PRINT PEEK(886) should return the number 173. If it does not, repeat the steps above, making sure that A$ ("PROOFREADER.T") contains 13 characters and that B$ contains 10 spaces.

You can now reload the Proofreader into memory whenever LOAD or SAVE destroys it, restoring your personal typing helper.

Incidentally, you can protect the cassette buffer on the Commodore 64 with POKE 178,165. This POKE should work on the VIC, but it has caused numerous problems, probably due to a bug in the VIC operating system. With this POKE, the 64 will not wipe out the cassette buffer during tape LOADs and SAVEs.

Program 1: VIC/64 Proofreader

```
100 PRINT"{CLR}PLEASE WAIT...":FORI=886TO
    1018:READA:CK=CK+A:POKEI,A:NEXT
110 IF CK<>17539 THEN PRINT"{DOWN}YOU MAD
    E AN ERROR":PRINT"IN DATA STATEMENTS.
    ":END
120 SYS886:PRINT"{CLR}{2 DOWN}PROOFREADER
     ACTIVATED.":NEW
886 DATA 173,036,003,201,150,208
892 DATA 001,096,141,151,003,173
898 DATA 037,003,141,152,003,169
904 DATA 150,141,036,003,169,003
910 DATA 141,037,003,169,000,133
916 DATA 254,096,032,087,241,133
922 DATA 251,134,252,132,253,008
928 DATA 201,013,240,017,201,032
934 DATA 240,005,024,101,254,133
940 DATA 254,165,251,166,252,164
946 DATA 253,040,096,169,013,032
952 DATA 210,255,165,214,141,251
958 DATA 003,206,251,003,169,000
964 DATA 133,216,169,019,032,210
970 DATA 255,169,018,032,210,255
976 DATA 169,058,032,210,255,166
982 DATA 254,169,000,133,254,172
988 DATA 151,003,192,087,208,006
994 DATA 032,205,189,076,235,003
1000 DATA 032,205,221,169,032,032
1006 DATA 210,255,032,210,255,173
1012 DATA 251,003,133,214,076,173
1018 DATA 003
```

Program 2: Atari Proofreader

```
100 GRAPHICS 0
110 FOR I=1536 TO 1700:READ A:POKE I
    ,A:CK=CK+A:NEXT I
120 IF CK<>19072 THEN ? "Error in DA
    TA statements. Check typing":END
130 A=USR(1536)
140 ? :? "Automatic Proofreader now
    activated."
150 END
1536 DATA 104,160,0,185,26,3
1542 DATA 201,69,240,7,200,200
1548 DATA 192,34,208,243,96,200
1554 DATA 169,74,153,26,3,200
1560 DATA 169,6,153,26,3,162
1566 DATA 0,189,0,228,157,74
1572 DATA 6,232,224,16,208,245
1578 DATA 169,93,141,78,6,169
1584 DATA 6,141,79,6,24,173
1590 DATA 4,228,105,1,141,95
1596 DATA 6,173,5,228,105,0
1602 DATA 141,96,6,169,0,133
1608 DATA 203,96,247,238,125,241
1614 DATA 93,6,244,241,115,241
1620 DATA 124,241,76,205,238,0
1626 DATA 0,0,0,0,32,62
1632 DATA 246,8,201,155,240,13
1638 DATA 201,32,240,7,72,24
1644 DATA 101,203,133,203,104,40
1650 DATA 96,72,152,72,138,72
1656 DATA 160,0,169,128,145,88
1662 DATA 200,192,40,208,249,165
1668 DATA 203,74,74,74,74,24
1674 DATA 105,161,160,3,145,88
1680 DATA 165,203,41,15,24,105
1686 DATA 161,200,145,88,169,0
1692 DATA 133,203,104,170,104,168
1698 DATA 104,40,96
```

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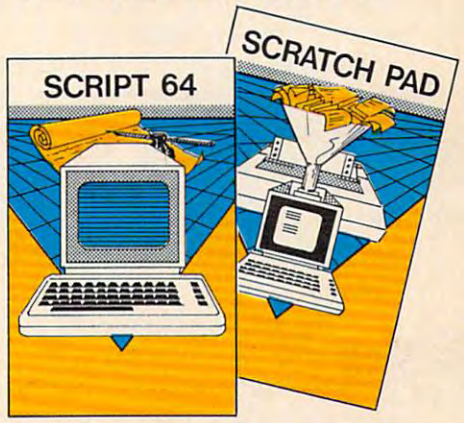

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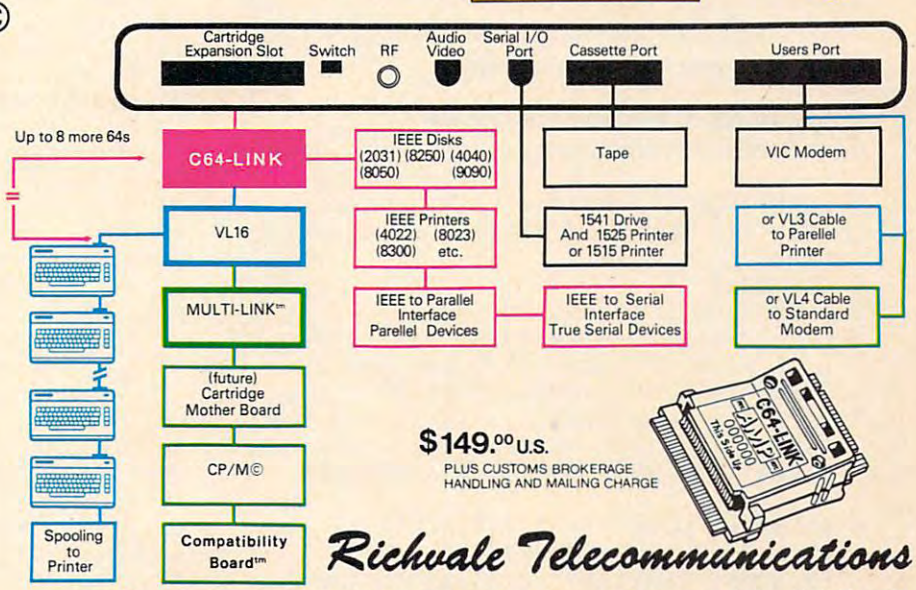

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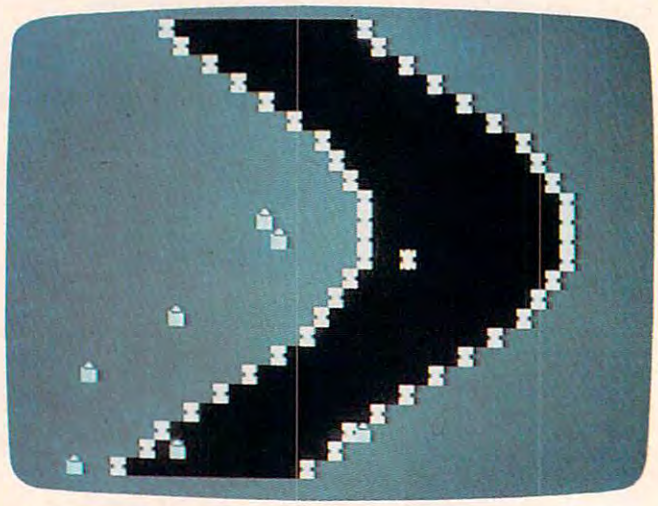
ROADER

Brian Foley

Your driving skills and endurance are put to the test as you careen around curves and dodge highway hazards in "Roader." Versions for Commodore 64, VIC, Atari, TI-99/4A, Apple, IBM PC, and TRS Color Computer. See the "Automatic Proofreader" article on page 60 before typing in VIC, 64, or Atari versions.



The car speeds down an ever-narrowing roadway in the Commodore 64 version of "Roader."

The object of "Roader" is to control a car on a winding road while dodging obstacles. As you drive farther, the road becomes more and more narrow, making a crash more likely. The longer you stay on the road, the higher your score.

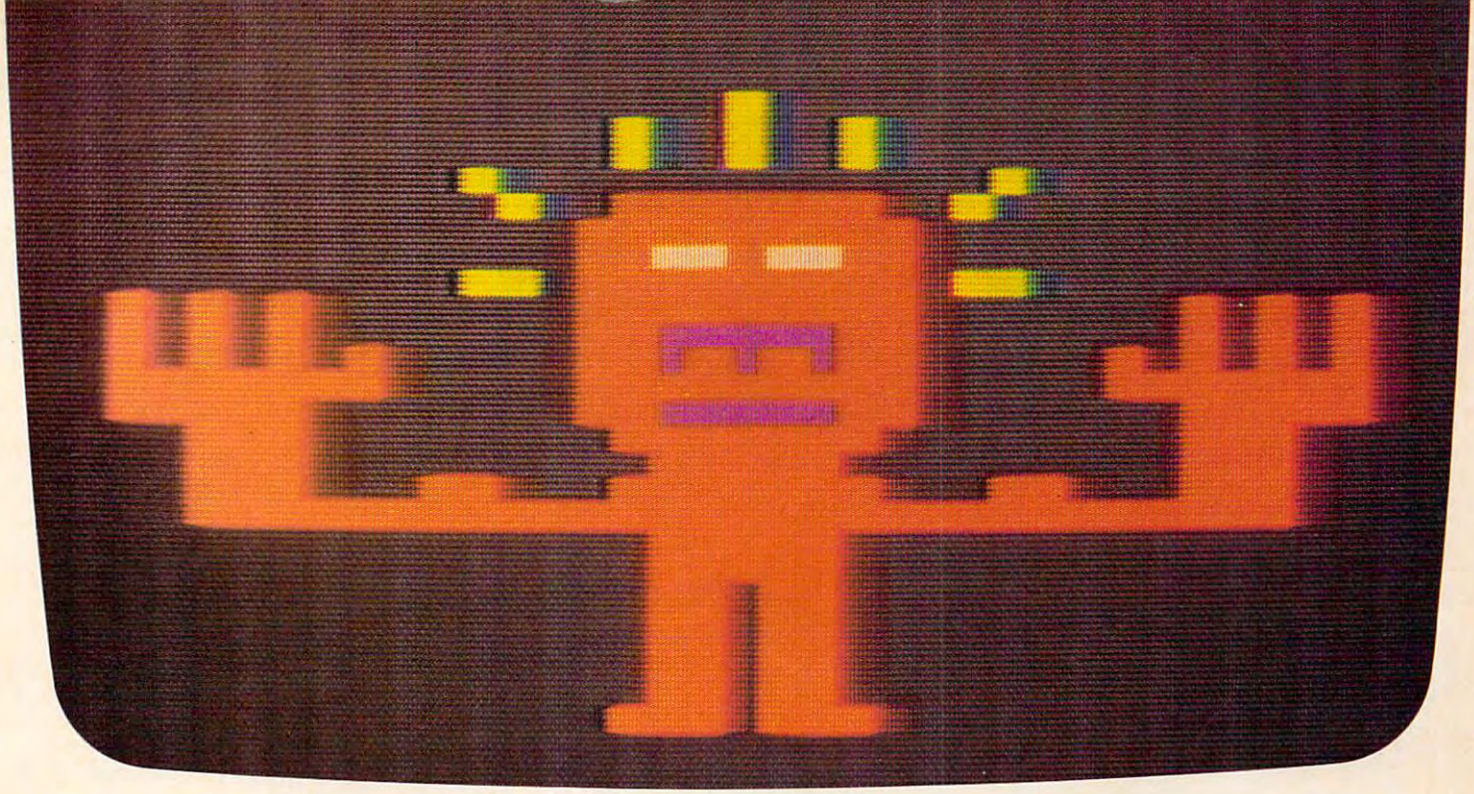
When you RUN the program, the computer will wait for you to set the level of difficulty, from one to four. One is for the beginner, two is faster, with a more twisted road. Three selects a slower speed and a less curvy road, but one which has obstacles. Four selects a fast, curvy road with obstacles. With these four levels of difficulty, Roader should be challenging for everyone.

If you hit the side of the road or crash into an obstacle, you'll hear three explosions. The width of the road and your score then appear on the screen.

The car can be steered with a joystick (port 2 on the 64) or with the keyboard. Push the C key to move it left, and the M key to move it right. The instructions for keyboard control are in line 50 of Program 1 and can easily be changed to any other characters of your choice.

Program 1: Roader For The 64

```
Ø PRINTCHR$(142):POKE52,48:POKE56,48:CLR
                                    :rem 149
1 POKE53280,1:POKE53281,1:PRINT"{CLR}
  {RED}{10 DOWN}{10 RIGHT}JUST A MOMENT P
  LEASE"                            :rem 31
2 GOSUB26Ø                          :rem 74
3 POKE53280,15:POKE53281,15         :rem 244
4 PRINT"{CLR}{3 DOWN}{5 RIGHT}{RED}ENTER
  {SPACE}:{7}":PRINT"{3 DOWN}"TAB(12)"
  {BLK}1{4} FOR {WHT}NOVICE{7}"     :rem 121
5 PRINT"{3 DOWN}"TAB(12)"{BLK}2{4} FOR
  {SPACE}{WHT}PRO{7}":PRINT"{3 DOWN}"TA
  B(12)"{BLK}3{4} FOR {WHT}EXPERT{7}"
                                    :rem 157
6 PRINT"{3 DOWN}"TAB(12)"{BLK}4{4} FOR
  {SPACE}{WHT}PERFECT{7}":PRINT"
  {3 DOWN}"TAB(12)"{BLK}5{4} TO {WHT}QU
  IT{7}"                            :rem 225
7 GETB$:IFB$=""THEN7                :rem 147
8 J=VAL(B$):IFJ<1ORJ>5THEN7         :rem 157
9 L=54272:IFJ=5THENPOKE53272,21:SYS2048
                                    :rem 66
1Ø IFA$="N"THEN14                   :rem 184
11 PRINT"{CLR}{WHT}{6 DOWN}{6 SPACES}USE
   {SPACE}C AND M KEYS TO MOVE LEFT AND R
   IGHT RESPECTIVELY"               :rem 178
12 PRINT"{DOWN}YOU CAN ALSO USE THE JOYST
   ICK IN PORT 2"                   :rem 143
13 FORS=1TO3ØØØ:NEXTS               :rem 62
14 PRINTCHR$(147)                   :rem 224
15 POKE65Ø,255:N=1516               :rem 138
16 POKE53280,11:POKE53281,11        :rem 32
17 I=.1:IFJ=2ORJ=4THENI=.2:N=1518:rem 212
18 AM$="DDDDDDDDDDDDD"              :rem 144
22 FORQ=1TO4                        :rem 225
23 FORC=13TOØSTEP-1                 :rem 157
25 FORA=1TO7.2STEPI                 :rem 188
26 Y=COS(A)                         :rem 117
27 F=F+1:R=RND(Ø)                   :rem 188
28 IFPEEK(N+4Ø)=65ORPEEK(N-1)=65ORPEEK(N+
   1)=65ORPEEK(N-4Ø)=65THEN11Ø      :rem 39
29 PRINTTAB(1Ø*Y+13);"{8}A";"{BLK}";LEF
   T$(AM$,C);"{8}A{WHT}":IFR>.5THEN4Ø
                                    :rem 168
3Ø IFJ=1ORJ=2THEN4Ø                 :rem 151
32 IFF>25THENX=INT(25*RND(1)):POKE1944+X+
   L,3:POKE1944+X,66                :rem 192
4Ø IFF>=25THENPOKEN+L,1:POKEN,64:FORT=1TO
   5Ø:NEXTT:POKEN+L,Ø:POKEN,68      :rem 123
42 IFPEEK(N+4Ø)=65ORPEEK(N-1)=65ORPEEK(N+
   1)=65ORPEEK(N-4Ø)=65THEN11Ø      :rem 35
```



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Notes For The VIC, Atari, TI, Apple, IBM PC, And Color Computer Versions

"Roader" is a fast and exciting game, which puts you, the driver, on a difficult raceway. You must control your car skillfully, negotiating sharp turns while avoiding the pylons along the side of the road and the obstacles that appear randomly in levels 3 and 4.

In the VIC and Atari versions, your car is steered with the C and M keys. The TI-99/4A version of Roader uses the < and > keys or joystick 1, while the Apple version uses paddle (0). The TRS-80 Color Computer and the IBM PC versions use the left and right arrow keys to control the movement of the car.

The arrow keys on the TRS-80 Color Computer and the IBM PC should be tapped briskly, and not held down. The Caps Lock key on the IBM PC must be off for proper steering. If you use the joystick with the TI-99/4A version, be sure to release the ALPHA LOCK key.

```
43 IFF>=25THENP=PEEK(56320):D=15-(PAND15)
                                    :rem 120
44 IFD=4THENN=N-1:GOTO51            :rem 235
45 IFD=8THENN=N+1:GOTO51            :rem 238
46 IFD=6THENN=N+39:GOTO51            :rem 40
47 IFD=10THENN=N+41:GOTO51           :rem 77
49 GETB$                            :rem 179
50 N=N+(B$="C")-(B$="M")            :rem 150
51 IFPEEK(N)=66ORPEEK(N+40)=66ORPEEK(N-1)
   =66ORPEEK(N+1)=66THEN110         :rem 150
80 NEXTA:NEXTC:NEXTQ                :rem 110
110 POKEN,67:POKEN+L,2               :rem 52
120 POKEN-1,67:POKEN-1+L,7          :rem 246
130 POKEN+1,67:POKEN+1+L,7          :rem 243
140 POKEN+40,67:POKEN+40+L,15       :rem 137
150 POKEN-40,67:POKEN-40+L,15       :rem 142
160 V=54296:W=54276:A=54277:H=54273:L=542
    72                              :rem 86
170 FORX=45TO0STEP-1:POKEV,X:POKEW,129:PO
    KEA,15 :POKEH,40:POKEL,200:NEXT
                                    :rem 30
180 POKEW,0:POKEA,0:F=0:D=0         :rem 89
190 POKE198,0:PRINT"THE ROAD IS ";C;"FEET
     WIDE"                          :rem 191
200 PRINT"SO YOUR SCORE IS ";INT(10000/C)
                                    :rem 70
210 PRINT"PLAY AGAIN (Y/N)?...OR FIRE BUT
    TON"                            :rem 141
215 P=PEEK(56320):FR=PAND16:IFFR=0THEN14
                                    :rem 150
220 GET A$:IFA$=""OR(A$<>"Y"ANDA$<>"N"AND
    FR<>0)THEN215                   :rem 22
230 IFA$="Y"THEN14                  :rem 247
240 IFA$="N"THEN3                   :rem 187
260 POKE56334,PEEK(56334)AND254     :rem 225
270 POKE1,PEEK(1)AND251              :rem 55
280 FORI=0TO511:POKEI+12288,PEEK(I+53248)
    :NEXT                           :rem 232
290 POKE1,PEEK(1)OR4                :rem 163
300 POKE56334,PEEK(56334)OR1         :rem 64
310 POKE53272,(PEEK(53272)AND240)OR12
                                    :rem 41
320 FORC=12800TO12839:READZ:POKEC,Z:NEXT
                                    :rem 252
330 DATA153,255,189,60,60,189,255,153
                                    :rem 94
340 DATA255,255,255,60,60,255,255,255
                                    :rem 89
350 DATA24,60,128,255,255,255,255,255
                                    :rem 89
360 DATA154,82,0,27,216,0,74,137    :rem 83
365 DATA255,255,255,255,255,255,255,255
                                    :rem 204
370 RETURN                          :rem 122
```

Program 2: VIC Roader

```
0 POKE56,28:POKE52,28:CLR           :rem 225
1 POKE36879,110:PRINT"{CLR}{WHT}{10 DOWN}
  JUST A MOMENT PLEASE"             :rem 141
2 GOSUB280                           :rem 76
3 POKE36879,59                       :rem 13
4 PRINT"{CLR}{3 DOWN}{BLK}ENTER:":PRINT"
  {2 DOWN}"TAB(6)"{BLK}1{BLK} FOR {RED}NO
  VICE"                             :rem 250
5 PRINT"{2 DOWN}"TAB(6)"{BLK}2{BLK} FOR
  {RED}PRO":PRINT"{2 DOWN}"TAB(6)"{BLK}3
  {BLK} FOR {RED}EXPERT"            :rem 13
6 PRINT"{2 DOWN}"TAB(6)"{BLK}4{BLK} FOR
  {RED}PERFECT":PRINT"{2 DOWN}"TAB(6)"
  {BLK}5{BLK} TO {RED}QUIT"         :rem 235
7 GETB$:IFB$=""THEN7                :rem 147
8 J=VAL(B$):IFJ<1ORJ>5THEN7         :rem 157
9 L=30720:IFJ=5THENPRINT"{CLR}":END
                                    :rem 231
10 IFA$="N"THEN14                   :rem 184
11 PRINT"{CLR}{BLK}{6 DOWN}USE C AND M KE
   YS TO{3 SPACES}MOVE LEFT AND RIGHT"
                                    :rem 158
13 FORS=1TO3000:NEXTS                :rem 62
14 PRINTCHR$(147)                   :rem 224
15 POKE650,255:N=7908               :rem 149
16 REM POKE36879,25                  :rem 30
17 I=.1:IFJ=2ORJ=4THENI=.2:N=7905:rem 218
19 AM$="''''''''''"                 :rem 252
22 FORQ=1TO4                        :rem 225
23 FORC=9TO0STEP-1                  :rem 114
25 FORA=1TO7.2STEPI                 :rem 188
26 Y=COS(A)                         :rem 117
27 F=F+1:R=RND(1):IFF>23THENPOKE36878,15
                                    :rem 111
29 PRINTTAB(5*Y+6);"{BLU}$";"{BLK}";LEFT$
   (AM$,C);"{BLU}$":IFR>.5THEN40    :rem 23
30 IFJ=1ORJ=2THEN40                 :rem 151
32 IFF>23THENX=INT(23*RND(1)+1):POKE8142+
   X+L,2:POKE8142+X,37               :rem 15
40 IFF>=23THENPOKEN+L,0:POKEN,35:FORT=1TO
   90:NEXTT:POKEN+L,0:POKEN,39      :rem 120
42 IFPEEK(N)=36ORPEEK(N+22)=36ORPEEK(N-1)
   =36ORPEEK(N+1)=36THEN110         :rem 138
49 GETB$                            :rem 179
50 N=N+(B$="C")-(B$="M")            :rem 150
51 IFPEEK(N)=37ORPEEK(N+22)=37ORPEEK(N-1)
   =37ORPEEK(N+1)=37THEN110         :rem 142
80 NEXTA:NEXTC:NEXTQ                :rem 110
110 POKEN,38:POKEN+L,2               :rem 50
120 POKEN-1,38:POKEN-1+L,7          :rem 244
```

Last Year Over 20,000 Americans Were Committed To Asylum.

Once people enter *Asylum*™, they don't *want* to leave. And neither will you.

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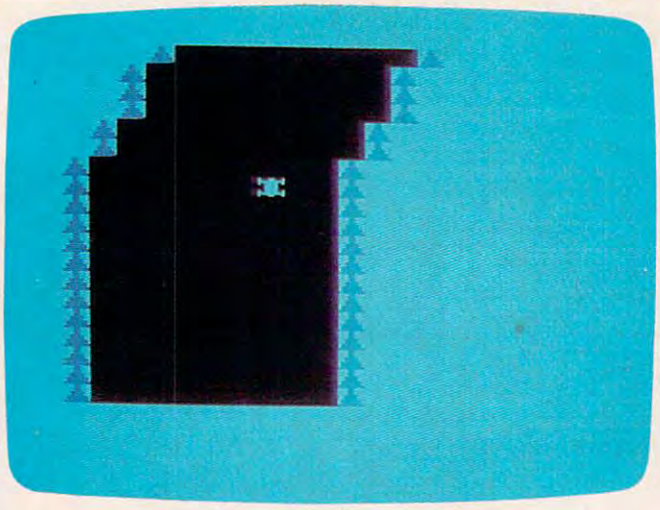
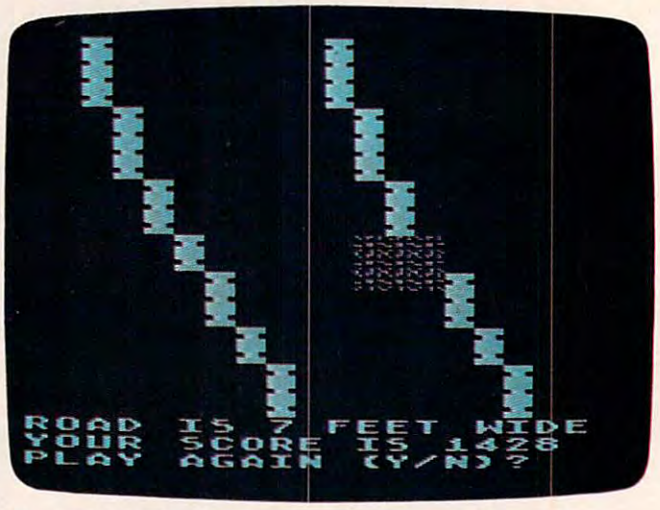


"Roader," VIC version.



The car has crashed in the Atari version of "Roader."

```
130 POKEN+1,38:POKEN+1+L,7          :rem 241
140 POKEN+22,38:POKEN+22+L,4        :rem 85
150 POKEN-22,38:POKEN-22+L,4        :rem 90
160 POKE36877,220:FORT=15TO0STEP-1:POKE36
    878,T                           :rem 19
170 FORM=1TO50:NEXTM                 :rem 8
180 NEXTT:POKE36877,0:POKE36878,0:F=0
                                    :rem 194
190 POKE198,0:PRINT"{BLU}{DOWN}ROAD WIDTH
     "; C;"FEET"                    :rem 201
200 PRINT"YOUR SCORE IS ";INT(10000/C)
                                    :rem 164
210 PRINT"{DOWN}PLAY AGAIN (Y/N)? "
                                    :rem 113
220 GET A$:IFA$=""OR(A$<>"Y"ANDA$<>"N")TH
    EN220                           :rem 253
230 IFA$="Y"THEN14                  :rem 247
240 IFA$="N"THEN3                   :rem 187
280 FORI=0TO511:POKEI+7168,PEEK(I+32768):
    NEXT                            :rem 189
310 FORC=7448TO7455:READZ:POKEC,255-Z:NEX
    T                               :rem 110
320 FORC=7456TO7487:READZ:POKEC,Z:NEXT
                                    :rem 170
330 DATA153,255,189,60,60,189,255,153
                                     :rem 94
340 DATA24,24,24,60,60,126,126,255
                                    :rem 177
350 DATA24,60,128,255,255,255,255,255
                                     :rem 89
360 DATA154,82,0,27,216,0,74,137   :rem 83
365 DATA255,255,255,255,255,255,255,255
                                    :rem 204
370 POKE36869,255:RETURN            :rem 187
```

Program 3: Atari Roader

```
CL 10 POKE 106,PEEK(106)-8:GOSUB 400:G
      OSUB 1500:POKE 708,13
LO 20 SCR=PEEK(88)+PEEK(89)*256:DIM AM
      $(10)
GA 30 POSITION 2,2:? #6;"{CLEAR}ENTER:
      ":POSITION 6,4:? #6;"1 FOR NOVIC
      E"
FI 40 POSITION 6,6:? #6;"2 FOR PRO":PO
      SITION 6,8:? #6;"3 FOR EXPERT"
PC 50 POSITION 6,10:? #6;"4 FOR PERFEC
      T":POSITION 6,12:? #6;"5 TO QUIT
      "
IC 60 J=PEEK(764):IF J<>24 AND J<>26 A
      ND J<>29 AND J<>30 AND J<>31 THE
      N 60
MA 70 IF J=29 THEN POKE 764,255:END
KB 75 IF A=35 THEN 100
OK 80 POSITION 1,10:? #6;"{CLEAR} USE
      + AND * KEYS TO MOVE LEFT AND RI
      GHT RESPECTIVELY"
CO 90 FOR I=1 TO 2000:NEXT I
JJ 100 ? #6;"{CLEAR}":N=SCR+246
CN 110 I=0.1:IF J=30 OR J=24 THEN I=0.
       2
MG 120 AM$="{10 SPACES}"
BB 130 FOR Q=1 TO 4
KA 140 FOR C=7 TO 0 STEP -1
PM 150 FOR R=1 TO 7.2 STEP I
LF 160 Y=COS(R)
PA 165 F=F+1:S=RND(0)
PO 166 IF F>23 THEN F=23:A=USR(1536)
DL 170 POSITION 4*Y+6,F:? #6;"$";AM$(1
       ,C);"$":IF S>0.5 THEN 200
FP 180 IF J=31 OR J=30 THEN 200
IB 190 IF F=23 THEN L=INT(420*RND(1)+2
       0):POKE N+L,69
DO 200 IF F=23 THEN POKE N,131:FOR T=1
        TO 20:NEXT T:POKE N,0
ON 210 IF PEEK(N)=4 OR PEEK(N+1)=4 OR
       PEEK(N-1)=4 OR PEEK(N+20)=4 THE
       N 275
GG 220 P=PEEK(764):IF P=18 THEN N=N-1:
       GOTO 240
HP 230 IF P=37 THEN N=N+1
CO 240 POKE 764,255
NO 260 IF PEEK(N)=69 OR PEEK(N+1)=69 O
       R PEEK(N-1)=69 OR PEEK(N+20)=69
        THEN 275
LA 270 NEXT R:NEXT C:NEXT Q
HA 275 FOR M=20 TO 29:SOUND 1,M,8,15:F
       OR V=1 TO 7:NEXT V
KJ 280 POKE N,198:POKE N-1,198:POKE N+
       1,198
LI 290 POKE N+20,198:POKE N-20,198:POK
       E N-19,198:POKE N-21,198
IG 300 POKE N+21,198:POKE N+19,198
CI 310 NEXT M:SOUND 1,0,0,0
HJ 320 REM
LH 330 F=0:POSITION 0,21
LI 340 ? #6;"ROAD IS";" ";C;" ";"FEET
       WIDE"
GP 350 ? #6;"YOUR SCORE IS";" ";INT(10
       000/C)
KM 360 ? #6;"PLAY AGAIN (Y/N)?  "
```

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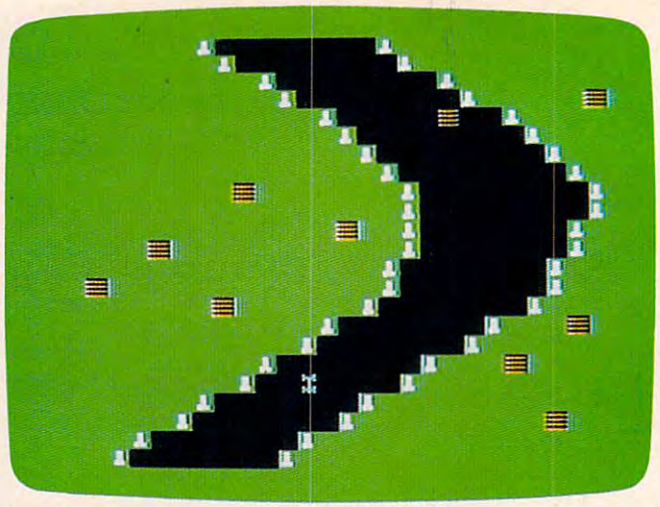
```
NJ 370 A=PEEK(764):IF A<>43 AND A<>35
       THEN 370
EO 380 IF A=43 THEN ? #6;"{CLEAR}":N=S
       CR+246:GOTO 140
AG 390 ? #6;"{CLEAR}":GOTO 30
HI 400 GRAPHICS 1+16:POSITION 0,12:? #
       6;"JUST A MOMENT PLEASE"
AH 405 ST=(PEEK(106)-8)*256
IB 410 FOR K=0 TO 511:POKE ST+K,PEEK(5
       7344+K):NEXT K:POKE 756,ST/256
NL 415 READ Y:IF Y=-1 THEN RETURN
HA 420 FOR X=Y TO Y+7:READ Z:POKE X+ST
       ,Z:NEXT X:GOTO 415
PB 430 DATA 24,153,255,189,60,60,189,2
       55,153
OL 440 DATA 32,255,255,255,60,60,255,2
       55,255
OK 450 DATA 40,24,60,128,255,255,255,2
       55,255
OM 460 DATA 48,154,82,0,27,216,0,74,13
       7
OK 470 DATA 56,255,255,255,255,255,255
       ,255,255,-1
PA 1500 FOR I=1536 TO 1595:READ A:CK=C
        K+A:POKE I,A:NEXT I
FI 1510 IF CK<>7887 THEN PRINT "Error
        in DATA--check typing."
KI 1520 RETURN
PJ 1536 DATA 24,165,88,133,203,105
PG 1542 DATA 20,133,205,165,89,133
OM 1548 DATA 204,105,0,133,206,162
PL 1554 DATA 23,160,19,177,205,145
PJ 1560 DATA 203,136,16,249,24,165
BK 1566 DATA 205,133,203,105,20,133
FD 1572 DATA 205,165,206,133,204,105
PD 1578 DATA 0,133,206,202,208,227
MI 1584 DATA 160,19,169,0,145,203
JC 1590 DATA 136,16,251,104,96,0
```

Program 4: Roader For The TI-99/4A

```
100 F=12
110 GOTO 200
120 FOR VOL=1 TO 30 STEP 10
130 CALL SOUND(-1000,-7,VOL)
140 CALL SCREEN(INT(VOL/2.5)+1)
150 F=19-F
160 CALL COLOR(9,F,1)
170 NEXT VOL
180 CALL COLOR(9,7,1)
190 RETURN
200 CALL CHAR(99,"223E2A08082A3E2A")
210 CALL CHAR(100,"447C541000A2E3F7F
    ")
220 CALL CHAR(101,"00080C1E1E3E3F7F
    ")
230 CALL CHAR(104,"0018181818183C3C00
    ")
240 CALL CHAR(120,"FFFFFFFFFFFFFFFF
    ")
250 CALL CHAR(128,"00FF00FF00FF00FF
    ")
260 CALL COLOR(9,5,1)
270 CALL COLOR(10,16,1)
280 CALL COLOR(11,9,1)
290 CALL COLOR(12,2,1)
300 CALL COLOR(13,9,2)
310 CALL CLEAR
320 CALL SCREEN(15)
330 PRINT
340 PRINT TAB(8);"c R O A D E R c"
350 FOR T=1 TO 6
360 PRINT
```



"Roader," TI version.

```
370 NEXT T
380 PRINT "STEER WITH THE < AND > K
    EYS"
390 PRINT
400 PRINT TAB(6);"OR USE JOYSTICK #
    1"
410 FOR T=1 TO 5
420 PRINT
430 NEXT T
440 FOR I=110 TO 120 STEP .5
450 CALL SOUND(-150,I,2)
460 NEXT I
470 FOR I=120 TO 110 STEP -.3
480 CALL SOUND(-150,I,2)
490 NEXT I
500 FOR T=110 TO 120 STEP .8
510 CALL SOUND(-75,T,2)
520 NEXT T
530 GOSUB 120
540 CALL SCREEN(15)
550 CALL COLOR(9,5,1)
560 FOR T=1 TO 250
570 NEXT T
580 CALL CLEAR
590 CALL COLOR(9,8,2)
600 OSKILL=1
610 PRINT TAB(2);"ENTER YOUR SKILL
    LEVEL..."
620 FOR T=1 TO 3
630 PRINT
640 NEXT T
650 PRINT TAB(4);"ENTER :"
660 PRINT
670 PRINT
680 PRINT TAB(8);"1 FOR NOVICE"
690 PRINT
700 PRINT TAB(8);"2 FOR PRO"
710 PRINT
720 PRINT TAB(8);"3 FOR EXPERT"
730 PRINT
740 PRINT TAB(8);"4 FOR PERFECT"
750 FOR D=1 TO 3
760 PRINT
770 NEXT D
780 CALL KEY(1,K,S)
790 RANDOMIZE
800 IF S=0 THEN 780
810 IF K<>18 THEN 840
820 SKILL=OSKILL
```

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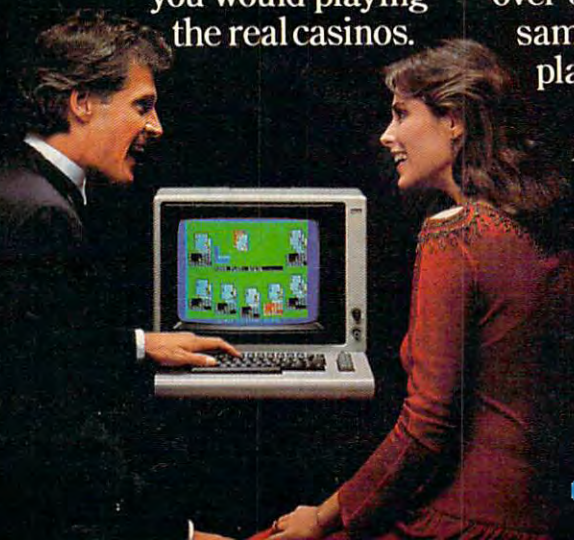

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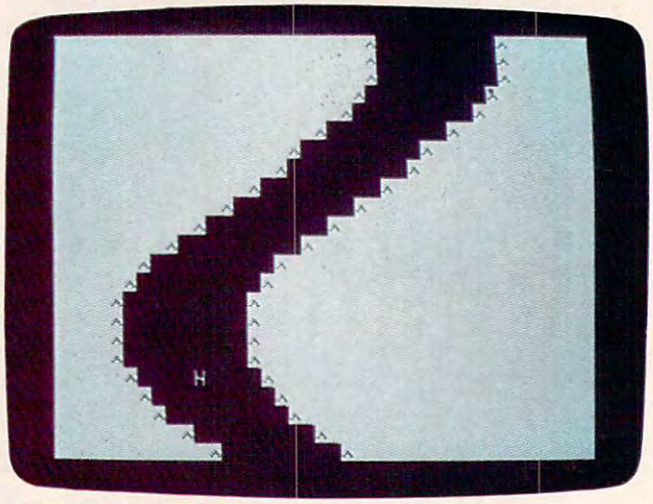
Ken Uston's Professional Blackjack™ runs in 48K on the Atari, Commodore 64, Apple and IBM PC.

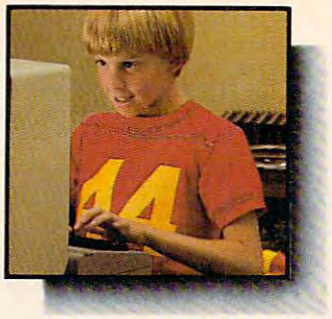
```
830 GOTO 860
840 SKILL=-(K=19)-(K=7)*2-(K=8)*3-(
    K=9)*4
850 IF SKILL=0 THEN 780
860 OSKILL=SKILL
870 PRINT
880 PRINT TAB(8);"HERE WE GO!!!"
890 PRINT
900 PRINT
910 FOR T=1 TO 400
920 NEXT T
930 CALL CLEAR
940 CALL SCREEN(3)
950 I=.1
960 IF (SKILL<>2)*(SKILL<>4)THEN 98
    0
970 I=.2
980 N=24
990 J=0
1000 OLDN=24
1010 B$="xxxxxxxx"
1020 FOR C=1 TO 4
1030 PRINT TAB(18);"h";B$;"h"
1040 NEXT C
1050 FOR Q=1 TO 4
1060 FOR C=9 TO 6 STEP -1
1070 IF C<>9 THEN 1090
1080 B$="xxxxxxxx"
1090 FOR A=0 TO 6.25 STEP I
1100 Y=COS(A)
1110 J=J+1
1120 PRINT TAB(8*Y+10);"h";B$;"h"
1130 IF (RND>.5)+(SKILL=1)+(SKILL=2
    )THEN 1160
1140 IF J<25 THEN 1160
1150 CALL HCHAR(23,28*RND+2,128)
1160 CALL GCHAR(20,N,G)
1170 CALL HCHAR(19,OLDN,120)
1180 IF (G=104)+(G=128)+(G=32)THEN
    1390
1190 CALL HCHAR(20,N,99)
1200 OLDN=N
1210 CALL KEY(0,K,S)
1220 IF S<>0 THEN 1240
1230 CALL JOYST(1,XR,YR)
1240 N=N+(K=44)-(K=46)+XR/4
1250 NEXT A
1260 B$=SEG$(B$,1,C-2)
1270 FOR D=110 TO 129-C STEP .5
1280 CALL SOUND(-150,D,2)
1290 NEXT D
1300 NEXT C
1310 NEXT Q
1320 CALL CLEAR
1330 CALL SCREEN(11)
1340 PRINT TAB(5);"YOU MADE IT, MAR
    IO !!"
1350 FOR T=1 TO 10
1360 PRINT
1370 NEXT T
1380 GOTO 1480
1390 CALL HCHAR(20-1,N,101)
1400 CALL HCHAR(20,N,100)
1410 GOSUB 120
1420 CALL SCREEN(3)
1430 FOR T=1 TO 500
1440 NEXT T
1450 CALL CLEAR
1460 CALL COLOR(9,8,2)
1470 GOTO 1510
1480 FOR I=1 TO 500
1490 NEXT I
1500 CALL CLEAR
1510 CALL SCREEN(15)
1520 PRINT TAB(6);"YOUR SCORE IS";J
    *10*SKILL
1530 FOR T=1 TO 5
1540 PRINT
1550 NEXT T
1560 PRINT TAB(8);"? PLAY AGAIN ?"
1570 PRINT
1580 PRINT
1590 PRINT TAB(4);"<FIRE BUTTON> OR
     <S>"
1600 PRINT TAB(8);"- FOR SAME LEVEL
    "
1610 PRINT
1620 PRINT TAB(4);"<C> - TO CHANGE
    LEVELS"
1630 PRINT
1640 PRINT TAB(4);"<E> - TO END PRO
    GRAM"
1650 CALL KEY(1,K,S)
1660 IF S=0 THEN 1650
1670 IF (K=18)+(K=2)THEN 930
1680 IF (K<>5)*(K<>14)THEN 1650
1690 IF K=14 THEN 580
1700 END
```



"Roader," Apple version.

Program 5: Roader For The Apple

```
100 N$ = " REDAOR":D = 0:A = 0:B = 0
110  HOME
120  FOR I = 1 TO 7:N$(I) =  MID$ (N$,
    I,1): NEXT I
130  FOR I = 1 TO 7:A = A + .4:N =  INT
    ( COS (A) * 8)
140  VTAB 24 - D - I: HTAB 20 + N: PRINT
    N$(I)
150  NEXT I:B = B + .4:A = B: IF D = 1
    6 THEN 170
160 D = D + 1: GOTO 130
170  VTAB 12: PRINT " WHAT SKILL LEVEL
     DO YOU WISH TO PLAY?"
180  PRINT : PRINT "1) EASY";: HTAB 26
    : PRINT "2) INTERMEDIATE"
190  PRINT "3) DIFFICULT";: HTAB 26: PRINT
    "4) EXPERT"
200  PRINT : PRINT "  USE PADDLE 0 TO
    CONTROL YOUR CAR.": PRINT
```



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It's equipped with a customized version of the S.A.M. speech synthesizer, developed by Don't Ask for Tronix to provide voice output.

Instead of drawing pictures, scrambling words, beating around the bush or playing "Hangman," Chatterbee teaches spelling the sensible, old-fashioned way.

Each word is spoken, then put in a contextual sentence. Just like a spelling bee. With one important difference.

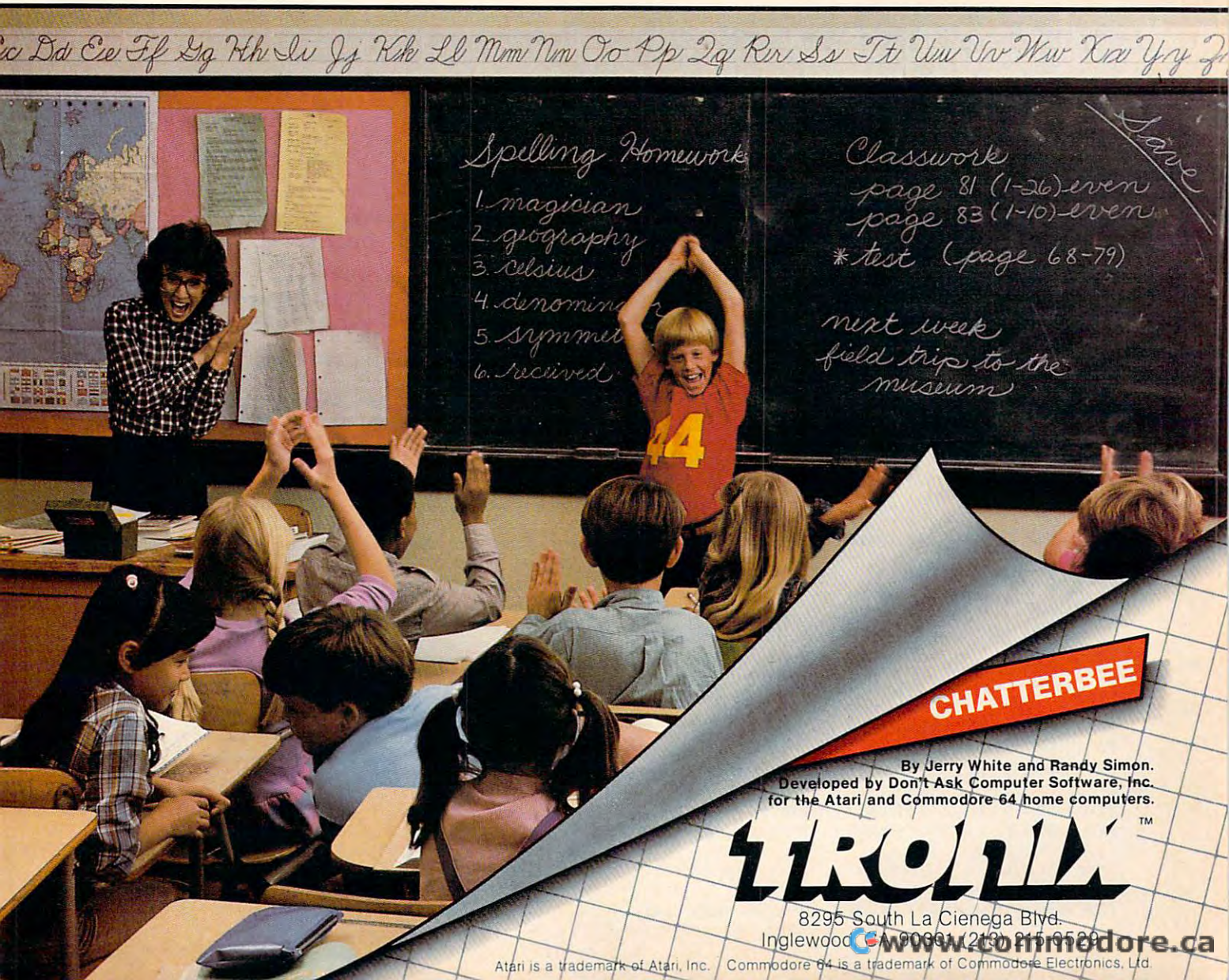
Since there's no classroom, there's no pressure. And no embarrassment.

Each of the 2500 words have been selected from current educational literature. And there's an internal scoring system that automatically places each player at the right level of difficulty and challenge.

The external scoring system rewards success and turns the whole thing into a game, complete with music.

Chatterbee. The spelling bee without the sting.

Hear today, spell tomorrow.



CHATTERBEE

By Jerry White and Randy Simon.
Developed by Don't Ask Computer Software, Inc.
for the Atari and Commodore 64 home computers.

TRONIX™

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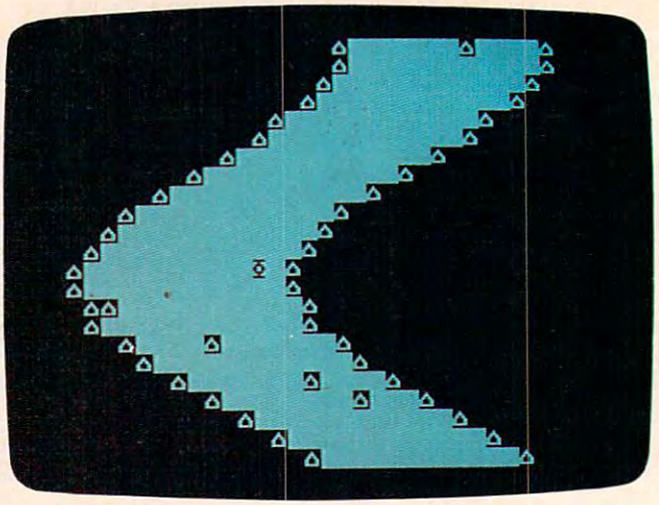
```
210  GET LV$:LV =  VAL (LV$)
220  IF LV < 1 OR LV > 4 THEN 210
230 C = 0: IF LV = 2 OR LV = 4 THEN C =
    .05
240 C = C + .05:C1 = 14:C2 = 25:A = 0:
    SC = 8
250 N$ = "
                "
260  HOME
270 A = A + C + LV / 16:Y =  INT ( COS
    (A) * 10)
280  POKE YLOC,160: INVERSE
290  PRINT  LEFT$ (N$,C1 + Y);: PRINT
    "^";: HTAB C2 + Y: PRINT "^";: PRINT
     LEFT$ (N$,C1 - Y + 1);
300 N =  INT ( PDL (0) / 7):XLOC = N +
    1360
310  IF  PEEK (XLOC) = 30 OR  PEEK (XL
    OC) = 42 OR  PEEK (XLOC) = 32 THEN
    380
320  NORMAL : POKE XLOC,200:YLOC = XLO
    C
330  IF LV = 1 OR LV = 2 THEN 350
340 G =  INT ( RND (1) * 120): IF G =
    1 THEN G =  INT ( RND (1) * 39): POKE
    1872 + G,42
350 D = D + 1: IF D / 120 =  INT (D /
    120) AND D < 480 THEN C1 = C1 + 1
    :SC = SC - 1
360  IF C < .25 THEN C = C + .001
370  GOTO 270
380  FOR I = 1 TO 20
390  FOR C = 1 TO 15:W =  PEEK ( - 163
    36): NEXT C
400  POKE XLOC - 128,220: POKE XLOC -
    128,225: POKE XLOC - 128,239: POKE
    XLOC - 128,223
410  NEXT I: NORMAL
420  HOME : VTAB 5: HTAB 10: PRINT " Y
    OUR SCORE IS ";: INVERSE : PRINT
     INT (10000 / SC): NORMAL
430  VTAB 10: PRINT "HIT THE PADDLE BU
    TTON TO PLAY AGAIN AT": HTAB 10: PRINT
    "THE SAME LEVEL, OR:": PRINT
440  PRINT "TYPE (S) TO START OVER, (E
    ) TO END."
450  IF  PEEK ( - 16384) = 197 THEN  POKE
     - 16287,0: END
460  IF  PEEK ( - 16384) = 211 THEN  POKE
     - 16287,0: GOTO 100
470  IF  PEEK ( - 16287) > 127 THEN 23
    0
480  GOTO 450
```

Program 6: PC Roader

```
10  DEF SEG=&HB800
20 CLS
30 COLOR 7,0
40 WIDTH 40
50 KEY OFF
60 J = 1000
70 COLOR 2,0:LOCATE 12,13:PRINT "R  O  A  D
 E  R"
80 FOR I=1 TO 2000:NEXT I
90 CLS
100 LOCATE 6,7 :PRINT"CHOOSE YOUR SKILL LEVE
L"
110 LOCATE 10,1 :PRINT"ENTER :"
120 LOCATE 12,15:PRINT"1. FOR NOVICE
  2. FOR PRO"
130 LOCATE 14,15:PRINT"3. FOR EXPERT
  4. FOR PERFECT"
140 A=VAL(INKEY$):IF A<1 OR A>4 THEN 140
```



The IBM version of "Roader" includes plenty of obstacles at higher levels.

```
150 COLOR 7,0
160 CLS
170 WI = 12
180 FOR T = 0 TO 6.25 STEP A/16 :B$ =STRING$
(2,255)+CHR$(127)+STRING$(WI,219)+CHR$(127)+
STRING$(2,255)
190 SOUND T^3+100,.0001
200 IF A >2 AND RND(1)<.05*(A-1)THEN MID$(B$
,RND(1)*(LEN(B$)-6)+4,1)=CHR$(127)
210 K= COS (T)
220 PRINT TAB(K*8+14);B$
230 IF Z >50 THEN WI =WI-1:Z=0:IF WI<=3 THEN
 WI=3
240 Z=Z+1
250 POKE J+1,120:POKE J,232
260  GOSUB 290
270 NEXT
280 GOTO 180
290 OF = F :OF2 = F2: F= PEEK(J+80):F2= PEEK
(J+81)
300 OJ = J
310 I$ = INKEY$:IF LEN (I$)=2 THEN G$=RIGHT$
(I$,1)ELSE G$=""
320 IF G$ =CHR$(75) AND J >960 THEN J=J-2
330 IF G$=CHR$(77) AND J  <1036  THEN  J= J+
2
335 F= PEEK(J+80):F2= PEEK(J+81)
340 IF F  = 127 OR F = 255 THEN FOR T = 0 TO
 255:POKE OJ,T :NEXT :SOUND 32767,1: GOTO 37
0
350 POKE OJ,OF:POKE OJ+1 ,OF2
360 RETURN
370 CLS :LOCATE 8,16:PRINT "Score";INT (1000
0/WI)
380 LOCATE 14,12:PRINT"Play Again Y or N?"
390 A$ = INKEY$ :IF A$="" THEN 380
400 IF A$<>"y" AND A$<>"n"THEN 380
410 IF A$= "y" THEN RUN
420 END
```

Program 7: Roader For The Color Computer

```
100  CLS:A=0:B=0:A$=" REDAOR":D=0
110  FOR I=1 TO 7:A$(I)=MID$(A$,I,1)
     :NEXT I
120  FOR I=1 TO 7:A=A+.25:N=INT(SIN(
     A)*8)
130  PRINT@480-I*32-D*32:PRINT TAB(1
     8+N)A$(I)
```

TAKE A BREAK!

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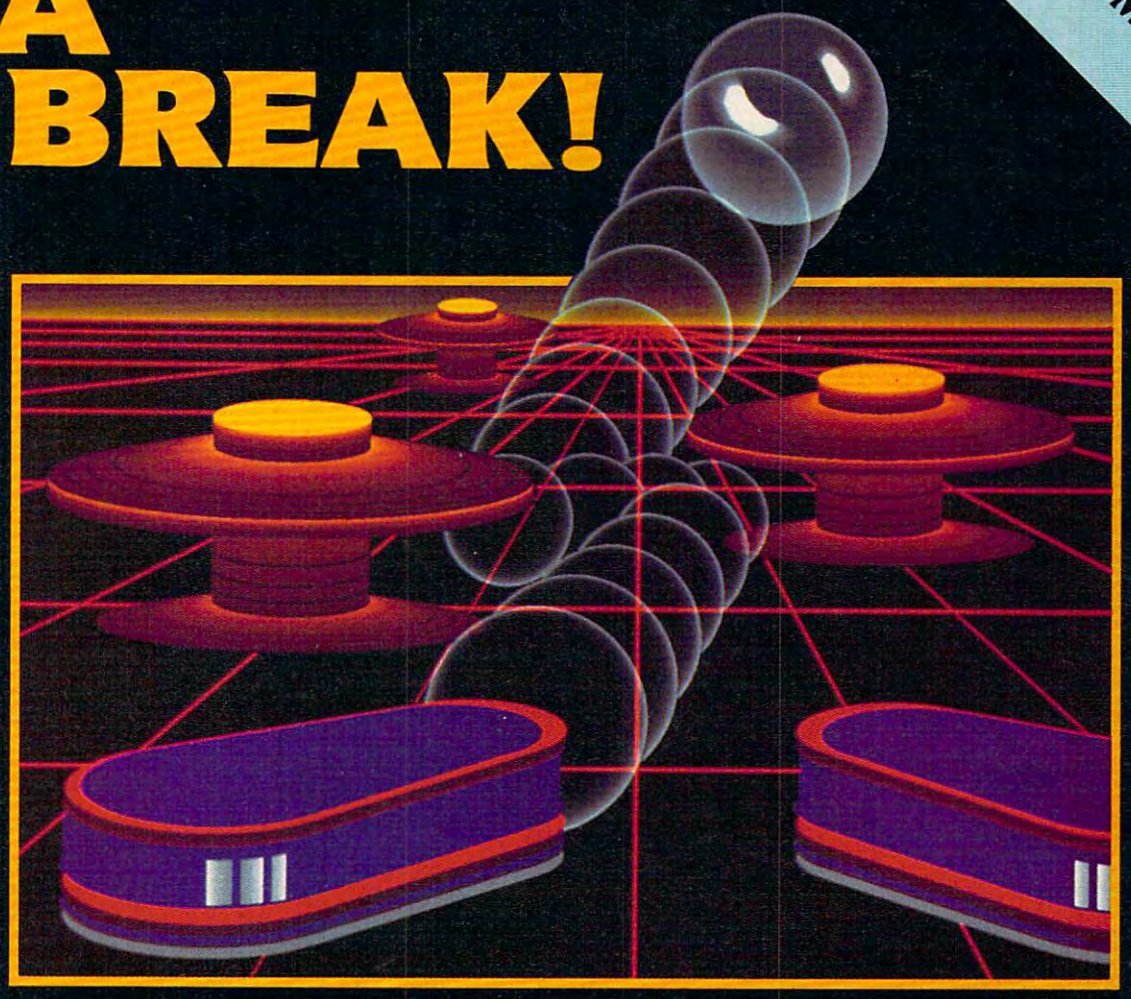

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```
140 NEXT I:B=B+.4:A=B: IF D=8 THEN
    160
150 D=D+1:GOTO 120
160 PRINT@260,"CHOOSE YOUR SKILL LE
    VEL"
170 PRINT@288," 1) EASY";:PRINT@304
    ,"2) INTERMEDIATE"
180 PRINT@320," 3) DIFFICULT";:PRIN
    T@336,"4) EXPERT":PRINT
190 PRINT@384,"USE LEFT AND RIGHT A
    RROW KEYS TO";
200 PRINT@425,"MOVE YOUR CAR."
210 LV=VAL(INKEY$):IF LV<1 OR LV>4
    THEN 210
220 CLS:C=0:IF LV=2ORLV=4 THEN C=.2
    :XLOC=328:GOTO240
230 C=.1:XLOC=335
240 C1=14:C2=25:A=0:YLOC=494:D=0:A=
    0:B=0:S=8:P=80:YLOC=XLOC:H=0
250 J=144:FOR I=1 TO 9:N$=N$+CHR$(J
    ):NEXT I
260 FOR I=1 TO 17:A=A+C:Y=INT(COS(A
    )*7)
270 PRINT @490+Y,CHR$(191);:PRINT@4
    91+Y,RIGHT$(N$,S);:PRINT@491+Y+
    S,CHR$(191):NEXT I
280 PRINT@XLOC,CHR$(175);
290 PRINT@5,"HIT (B) TO BEGIN PLAY"
300 K$=INKEY$:IF K$<>"B" THEN 300
310 A=A+C:Y=INT(COS(A)*7)
320 PRINT@490+Y,CHR$(191);:PRINT@49
    1+Y,RIGHT$(N$,S);:PRINT@491+Y+S
    ,CHR$(191)
330 PRINT@YLOC-32,CHR$(144);
340 F$=INKEY$:IF F$=CHR$(8) THEN XL
    OC=XLOC-1:GOTO 360
350 IF F$=CHR$(9) THEN XLOC=XLOC+1
360 IFPEEK(1024+XLOC)=96 OR PEEK(10
    24+XLOC)=255 OR PEEK(1024+XLOC)
    =191 THEN 450
370 D=D+1:IF D/75=INT(D/75) AND S>2
    THEN S=S-1
380 PRINT@XLOC,CHR$(175);
390 YLOC=XLOC
400 IF LV=1 OR LV=2 THEN 420
410 G=RND(3):IFG=1 THEN G=RND(31):P
    RINT@448+G,CHR$(255);
420 C=C+.00025:P=P-.2:H=H+1
430 FOR I=1TOP:NEXTI
440 GOTO 310
450 FOR I=255 TO 100 STEP -30:SOUND
     I,1:NEXT I
460 FOR I=0 TO 105: PRINT@XLOC,CHR$
    (143+I);:NEXT I
470 CLS:PRINT@70,"YOUR SCORE IS ";H
    *10*LV
480 PRINT@129,"<SPACE BAR> TO PLAY
    AGAIN ON":PRINT@169,"THE SAME L
    EVEL"
490 PRINT@229,"TYPE (S) TO START OV
    ER":PRINT
500 PRINT@296,"TYPE (E) TO END"
510 S$=INKEY$
520 IF S$="E" THEN END
530 IF S$="S" THEN 100
540 IF S$=" " THEN 220
550 GOTO 510
560 END
```

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Barrier Battle

Heath Lawrence

Here's an exciting, challenging game for the VIC, 64, TRS-80 Color Computer, Atari, and Apple. Try to outwit your opponent and plan ahead—things get dicey at the end.

An article about writing arcade-style games (COMPUTE!, February 1983) piqued my curiosity enough to make me write this simple, but challenging game. It uses a redefined character set and the technique of POKEing character locations from that article. I found that toying with the simple commands provided yields some satisfying results.

That tutorial did an excellent job of explaining this method, so I won't go into it in any great detail here.

The following is a basic explanation of the setup of the program and a description of game play. There is also a variable list for anybody who wants a more thorough understanding of the program.

Game Strategy

The object of "Barrier Battle" is to build barriers, using your joystick, and to cut off your opponent so that he or she runs out of room and collides with a wall or barrier.

By pressing the trigger, you can create a hole in your barrier. You can do this five times. This can be a very helpful strategy because escape routes become quite scarce near the conclusion of the conflict. At the bottom of the screen you can see how many holes each player has left.

A player is destroyed when he or she hits one of the side boundaries (the Atari symbols) or one of the player-built barriers.

The end of the game is marked by the appearance of the victorious player jumping for joy in the center of the screen. The winning player's identity is then revealed (in case of a close call) and the option to play again is offered.

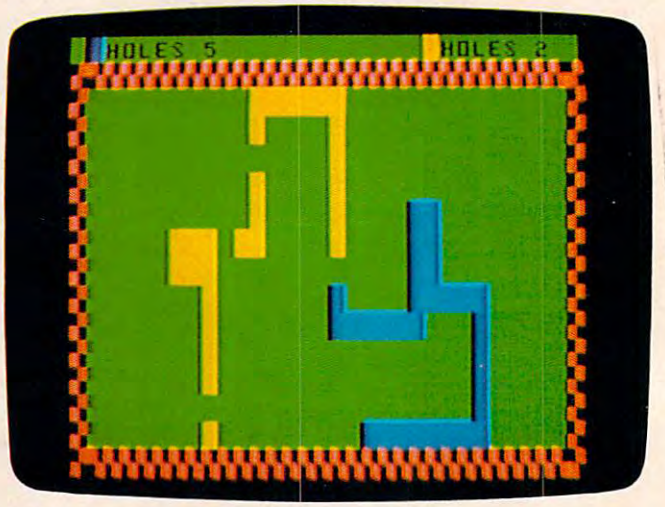
Playing Tips

At the beginning of the game it is a good idea to cut yourself a large part of the playfield to maneuver in. In the long run, it is the player with the most real estate left who is victorious.

When you find yourself out of room, try pressing the trigger and moving back and forth. This will only delay the inevitable, but it may stall long enough for the other player to smash into a barrier.

Variable List

SCR	Screen Memory Start address.
SIDE,WALL,BARR,BLANK	Player wall and blank characters which appear on screen when POKEd into SCR.
LN	Length of a single screen line.
VECTR,DIR	Variables that contain current player distance and direction.
LOC,POS	Current location of players.
M,N	Joystick variables.



"Barrier Battle," Color Computer version.

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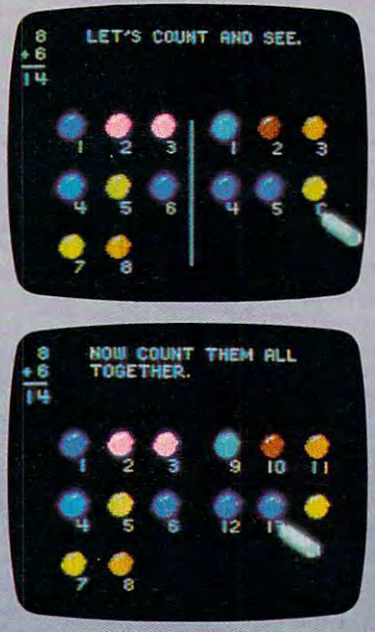

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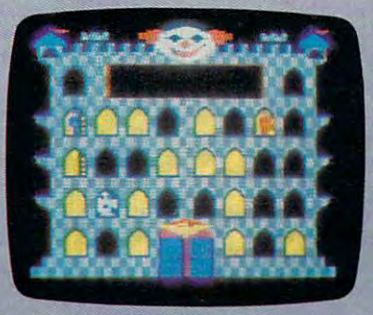

After each correct answer a player moves closer to capturing the key from the ghost and leaving the castle a winner.

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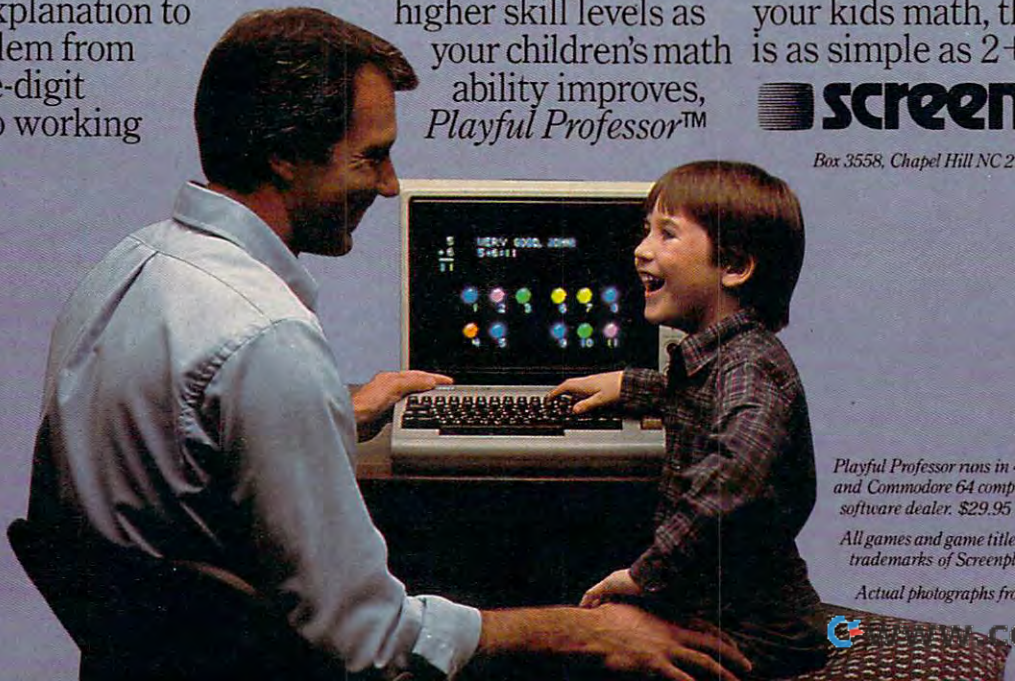


Playful Professor runs in 48K on the Atari and Commodore 64 computers. See your local software dealer. $29.95

Actual photographs from Commodore 64.

Program Rundown (Atari Version)

Lines 94–115. Set starting address for screen memory. Assign characters to variables. Set start positions and directions for both players. Set line length.

Lines 200–240. Set stick variables. Check sticks and assign direction.

Lines 300–312. Move players. Check for collisions. Check trigger to see if hole should be created.

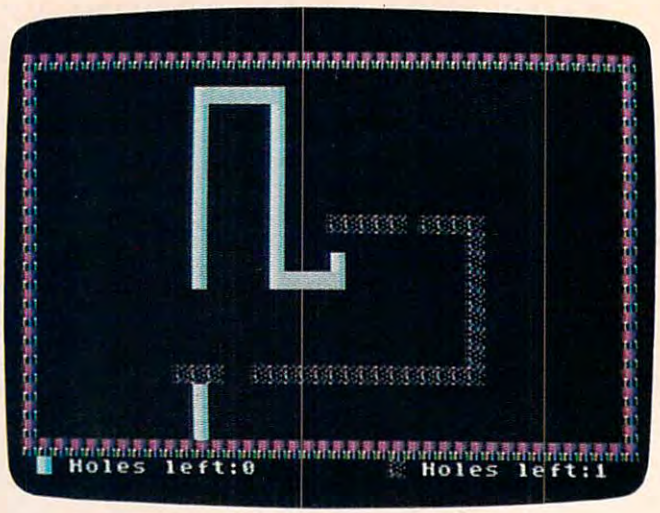
Lines 1000–1016. Routine to alter the character set.

Lines 5000–5006. Boundary routine (from Richard Mansfield's sample program).

Lines 6000–6012. Display winner and display play again?

Lines 6030–6038. Explosion sound and game over display.

Lines 7500–7520. Instructions and opening music.



In the Atari version of "Barrier Battle," the white player is about to crash into the wall.

Program 1: Atari Barrier Battle

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."

```
93 REM INITIALIZATION
94 LEV=5:GOSUB 1000
96 DIM A$(18),B$(18),S$(10)
98 A$=" {T} {DOWN}{3 LEFT}{B}■{V}
   {DOWN}{3 LEFT}{B} {V}":B$="{G}
   {T}{F}{DOWN}{3 LEFT}{B}■{V}{DOWN}
   {3 LEFT}{C} {Z}"
100 SIDE=31:WALL=128:BARR=32:BLANK=0
    :VAL1=5:VAL2=5
105 SCR=PEEK(88)+256*PEEK(89)
110 LN=40:VECTR=LN:DIR=-VECTR
115 LOC=SCR+LN*10+LN/2:POS=LOC
125 GOSUB 5000
199 REM CHECK STICKS
200 M=STICK(0):N=STICK(1)
205 IF M=14 THEN VECTR=-LN:GOTO 225
210 IF M=13 THEN VECTR=LN:GOTO 225
215 IF M=7 THEN VECTR=1:GOTO 225
220 IF M=11 THEN VECTR=-1
225 IF N=14 THEN DIR=-LN:GOTO 300
230 IF N=13 THEN DIR=LN:GOTO 300
235 IF N=7 THEN DIR=1:GOTO 300
240 IF N=11 THEN DIR=-1
299 REM MOVE PLAYERS
300 FOR SP=1 TO LEV:NEXT SP
302 LOC=LOC+VECTR:IF PEEK(LOC)=WALL
    OR PEEK(LOC)=BARR OR PEEK(LOC)=S
    IDE THEN P=1:GOTO 6000
304 IF STRIG(0)=0 AND VAL1<>0 THEN P
    OKE LOC,BLANK:VAL1=VAL1-1:POSITI
    ON 14,22:? VAL1:GOTO 308
306 POKE LOC,WALL:SOUND 1,LOC,10,8
308 POS=POS+DIR:IF PEEK(POS)=WALL OR
     PEEK(POS)=BARR OR PEEK(POS)=SID
    E THEN P=2:GOTO 6000
310 POKE POS,BARR:SOUND 1,POS,10,8
312 IF STRIG(1)=0 AND VAL2<>0 THEN P
    OKE POS,BLANK:VAL2=VAL2-1:POSITI
    ON 37,22:? VAL2
314 GOTO 200
999 REM REDEFINE
1000 GOSUB 7500
1002 POSITION 13,17:? "Please Wait"
1004 ST=(PEEK(106)-8)*256:IF PEEK(ST
     +256)=137 THEN 1012
1006 FOR X=0 TO 1023:POKE ST+X,PEEK(
     57344+X):NEXT X
1008 FOR X=0 TO 7:READ A:POKE ST+256
     +X,A:NEXT X
1010 FOR X=0 TO 7:READ A:POKE ST+248
     +X,A:NEXT X
1012 GOSUB 7510
1014 DATA 137,34,132,17,132,144,68,1
     37
1016 DATA 42,42,42,42,107,73,73,73
1018 RETURN
4999 REM DRAW BORDER
5000 ? CHR$(125):POKE 756,ST/256:SET
     COLOR 2,0,0:FOR I=0 TO LN-1:POK
     E SCR+I,SIDE:NEXT I:FOR I=0 TO
     LN-1
5002 POKE SCR+LN*21+I,SIDE:NEXT I
5004 FOR I=0 TO 21:POKE SCR+I*LN,SID
     E:NEXT I:FOR I=0 TO 21:POKE SCR
     +LN-1+I*LN,SIDE:NEXT I
5006 POSITION 1,22:? "■ Holes left:"
     ;VAL1:POKE SCR+LN-16+22*LN,BARR
     :POSITION 25,22:? " Holes left:
     ";VAL2
5008 RETURN
5999 REM END OF GAME ROUTINE
6000 GOSUB 6030:GRAPHICS 0:POKE 756,
     ST/256:POKE 752,1:SETCOLOR 2,0,
     0:POSITION 13,9:? "Player "
6002 IF P=1 THEN POKE SCR+LN-20+9*LN
     ,BARR
6004 IF P=2 THEN POKE SCR+LN-20+9*LN
     ,WALL
6006 POSITION 21,9:? " Wins!!"
6008 GOSUB 7000:POSITION 10,11:? "Pr
     ess trigger to play"
6010 IF STRIG(0) AND STRIG(1) THEN 6
     010
6012 GOTO 100
6029 REM EXPLOSION
```

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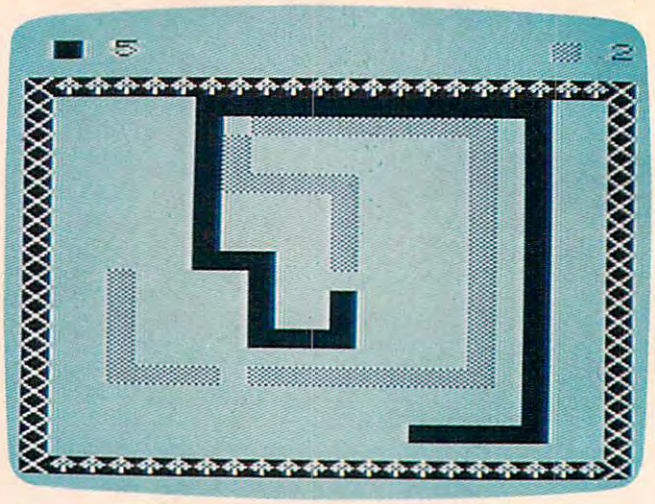
```
6030 POKE 752,1:FOR I=15 TO 0 STEP -
     0.2:SOUND 0,20,8,I:SOUND 1,75,8
     ,I+1:SOUND 2,175,8,I+3:SOUND 3,
     255,8,I+5:NEXT I
6032 FOR SO=1 TO 3:SOUND SO,0,0,0:NE
     XT SO
6034 ? CHR$(125):SETCOLOR 2,0,0
6036 POSITION 14,11:? "GAME
     {5 SPACES}OVER"
6038 FOR LOOP=1 TO 5:POSITION 19,10:
     ? A$:FOR D=1 TO 25:NEXT D:POSIT
     ION 19,10:? B$:FOR D=1 TO 45:NE
     XT D:NEXT LOOP:RETURN
7000 RESTORE 7002:FOR D=1 TO 8:READ
     Z:FOR DEL=0 TO 15 STEP 3:SOUND
     1,Z,10,DEL:NEXT DEL
7001 FOR DEL=15 TO 0 STEP -3:SOUND 1
     ,Z,10,DEL:NEXT DEL:FOR DEL=1 TO
      10:NEXT DEL:NEXT D
7002 DATA 162,121,128,121,96,108,121
     ,108
7004 RETURN
7500 REM INSTRUCTIONS
7502 GRAPHICS 0:POKE 752,1:SETCOLOR
     2,0,0:POSITION 9,1:? "** BARRIE
     R BATTLE **"
7504 ? :? :? :? :? :? "Use your joys
     tick to barricade your
     {3 SPACES}opponent into a colli
     sion with a wall."
7506 ? :? "You have 5 holes to use.
     These can be created by pressin
     g the trigger."
7508 RETURN
7510 TRAP 7550:POSITION 9,17:? "Spee
     d Level  (1-4)";:INPUT SK
7511 TRAP 40000
7512 IF SK<1 OR SK>4 THEN FOR I=1 TO
      37:POSITION I,15:? CHR$(32):NE
     XT I:GOTO 7510
7513 LEV=(SK-1)*10:POSITION 9,15:? "
     Press trigger to play"
7514 IF STRIG(0) AND STRIG(1) THEN 7
     514
7516 REM MUSIC
7518 RESTORE 7520:FOR D=1 TO 8:READ
     Z:FOR DEL=0 TO 15 STEP 3:SOUND
     1,Z,10,DEL:NEXT DEL
7519 FOR DEL=15 TO 0 STEP -3:SOUND 1
     ,Z,10,DEL:NEXT DEL:FOR DEL=1 TO
      10:NEXT DEL:NEXT D
7520 DATA 121,121,121,121,102,108,12
     1,136
7522 RETURN
7550 TRAP 40000:FOR I=1 TO 37:POSITI
     ON I,15:? CHR$(32):NEXT I:GOTO
     7510
```

Program 2: VIC Barrier Battle

Translation by Jeff Hamdani, Editorial Programmer

```
93 REM INITIALIZATION
94 POKE36879,25:LV=5:GOSUB1000
98 DIM A$(18),B$(18),M(18)
100 X=11:Y=12:SR=7680+X+22*Y:SD=216:SS=10
    2:C=30720
101 POKE198,0:WL=160:BR=214:BK=32:V1=5:V2
    =5
105 LN=22:VE=LN:DR=-LN:
115 LC=SR:PS=LC
130 PRINT"{CLR}{RIGHT}{BLK}{RVS} {OFF}" V
    1;
140 PRINT"{14 RIGHT}{BLU}{RVS}[+]{OFF}"
    ;V2
```



VIC version of "Barrier Battle."

```
145 GOSUB5000
199 REM CHECK JOYSTICKS
200 DD=37154:P1=37151:P2=37152:IF V2=2 TH
    EN FOR I=1 TO 40000:NEXT
201 POKEDD,127:P=PEEK(P2)AND128:J0=-(P=0)
203 IFJ0=1THENVE=1:GOTO229
204 POKEDD,255:P=PEEK(P1)
205 FB=-((PAND32)=0)
221 J3=-((PAND4)=0):IFJ3=1THENVE=-LN:GOTO
    229
223 J1=-((PAND8)=0):IFJ1=1THENVE=LN:GOTO2
    29
227 J2=-((PAND16)=0):IFJ2=1THENVE=-1
229 GETZ$:IFZ$=""THENGOTO300
230 IFZ$="I"THENDR=-LN:GOTO300
233 IFZ$="M"THENDR=LN:GOTO300
236 IFZ$="K"THENDR=1:GOTO300
239 IFZ$="J"THENDR=-1
299 REM MOVE PLAYERS
300 FORSP=1TOLV:NEXTSP
301 LC=LC+VE:GOSUB7600
302 IFPEEK(LC)<>BKTHENP=1:GOTO6000
304 IFFB=0ORV1=0THEN307
305 POKELC,BK:V1=V1-1:POKE7683,V1+48:GOTO
    308
307 POKELC,WL:POKELC+C,0
308 PS=PS+DR
309 IFPEEK(PS)<>32THENP=2:GOTO6000
310 IFZ$<>" "ORV2=0THEN314
312 POKEPS,BK:V2=V2-1:POKE7701,V2+48:GOTO
    315
314 POKEPS,SS:POKEPS+C,6
315 GOTO200
999 REM REDEFINING
1000 GOSUB7502:PRINT"{2 DOWN}{2 RIGHT}TO
     {SPACE}START, PRESS THE":PRINT"{RVS}
     TRIGGER{OFF} OR {RVS}SPACEBAR{OFF}."
1010 GETX$:P=PEEK(37151):FB=-((PAND32)=0)
     :IF(FB=0)AND(X$="")THEN1010
1018 GOSUB7510:RETURN
4999 REM DRAW BORDER
5000 FORI=7724TO7745:POKEI,SD:POKEI+C,2:N
     EXT
5002 FORI=8164TO8185:POKEI,SD:POKEI+C,2:N
     EXT
5004 FORI=7724TO8164STEP22:POKEI,BR:POKEI
     +C,2:NEXT
5005 FORI=7745TO8185STEP22:POKEI,BR:POKEI
     +C,2:NEXT
```

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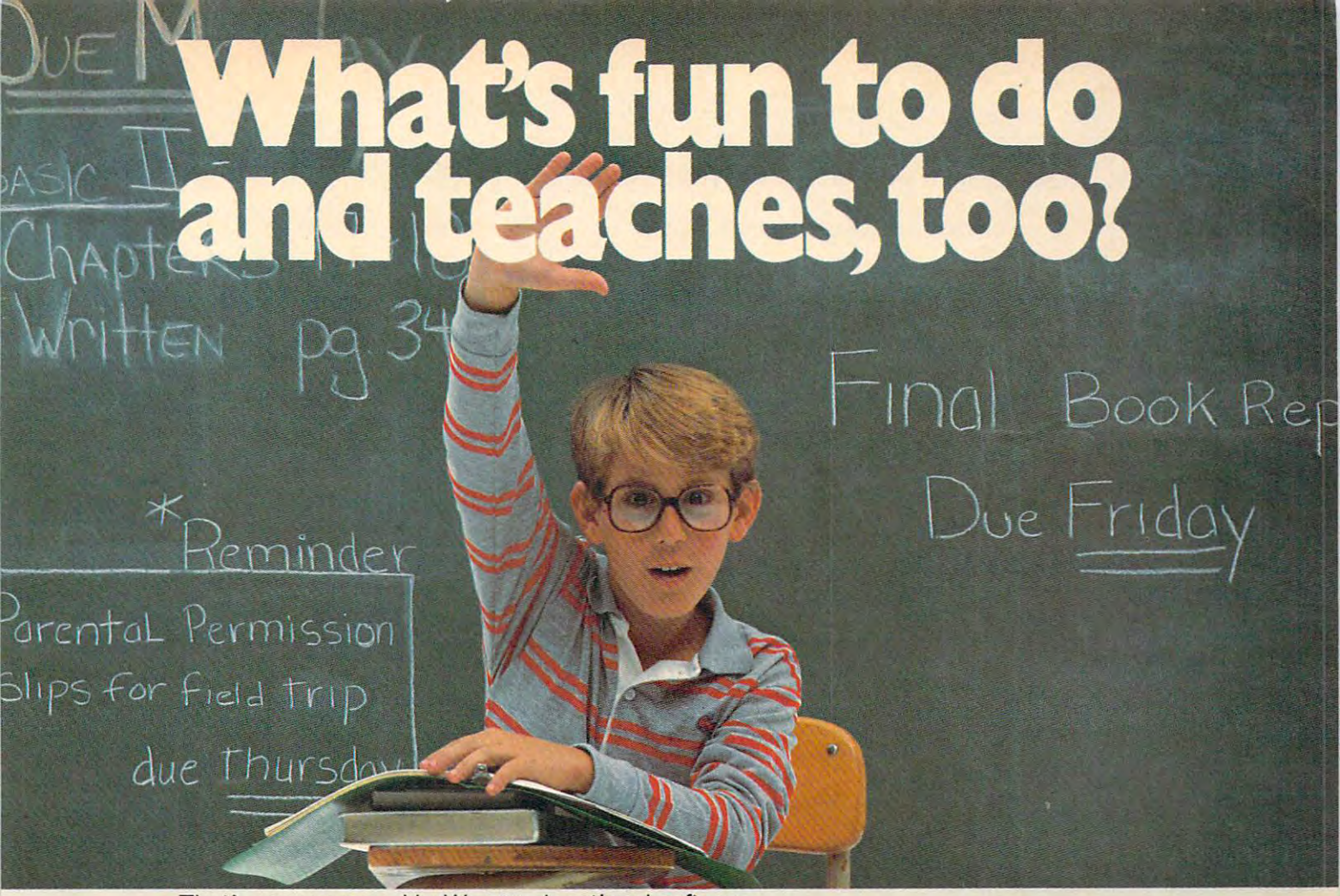

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```
5008 RETURN
5999 REM END OF GAME ROUTINE
6000 GOSUB6030:PRINT"{CLR}{13 DOWN}
     {4 RIGHT}{BLU}PLAYER{RIGHT}";
6002 IFP=1THENPOKE7977,SS:POKE7977+C,6
6004 IFP=2THENPOKE7977,WL:POKE7977+C,0
6006 PRINT"{2 RIGHT}WINS":FORI=1TO700:NEX
     TI:GOSUB 7000
6008 PRINT"{7 DOWN}{2 RIGHT}PRESS :":PRIN
     T"{DOWN}{RIGHT}{RVS}TRIGGER{OFF} OR
     {SPACE}{RVS}SPACEBAR{OFF}{3 SPACES}T
     O{RIGHT}CONTINUE, {RVS}{BLK}Q-QUIT
     {OFF}{BLU}"
6009 POKE198,0:P=PEEK(P1):FB=-((PAND32)=0
     )
6010 IFPEEK(197)=48THENPOKE198,0:END
6012 IFFB<>1ANDPEEK(197)<>32THEN6009
6013 GOTO100
6029 REM EXPLOSION
6030 POKE36877,220:FORL=15TO0STEP-1:POKE3
     6878,L
6035 FORM=1TO50:NEXTM:NEXTL:POKE36877,0
6040 POKE36878,0:RETURN
7000 PRINT"{CLR}{8 DOWN}{6 RIGHT}GAME OVE
     R{OFF}"
7005 RESTORE
7006 FORT=1TO18:READM(T):NEXT
7007 FORT=1TO9:READL(T):NEXT
7010 FORI=1TO5
7020 FORJ=1TO9:POKEL(J),M(J):POKEL(J)+C,6
     :NEXT
7030 FORK=1TO9:POKEL(K),M(K+9):POKEL(K)+C
     ,6:NEXT:NEXT
7050 DATA32,81,32,78,160,77,122,32,76,77,
     81,78,32,160,32,122,32,76
7060 DATA7909,7910,7911,7931,7932,7933,79
     53,7954,7955
7070 RETURN
7502 PRINT"{CLR}{4 RIGHT}{RVS}{BLU}BARRIE
     R BATTLE{OFF}{3 DOWN}"
7503 PRINT"{2 RIGHT}ONE PLAYER MUST USE":
     PRINT"JOYSTICK AND THE":PRINT"OTHER
     {SPACE}KEYBOARD (I,J,"
7504 PRINT"K,M).{2 SPACES}WITH THESE,":PR
     INT"CAUSE YOUR OPPONENT TOCOLLIDE WI
     TH A WALL."
7506 PRINT"{2 DOWN}{2 RIGHT}YOU HAVE 5 HO
     LES TO USE.{2 SPACES}CREATE THEM BY"
7507 PRINT"PRESSING THE TRIGGER{2 SPACES}
     OR SPACEBAR."
7508 RETURN
7510 PRINT"{CLR}{6 DOWN}SPEED LEVEL (1-4)
     ?"
7511 PRINT"{2 DOWN}(1 IS FASTEST)"
7512 GETS$:IFS$=""THEN7512
7513 SK=VAL(S$):IFSK<1ORSK>4THEN7512
7520 LV=(SK-1)*10:RETURN
7600 POKE36878,15
7610 FORL=1TO5:POKE36876,INT(RND(1)*128)+
     128
7620 NEXTL
7630 POKE36876,0:POKE36878,0:RETURN
```

Program 3: 64 Barrier Battle

Translation by Jeff Hamdani, Editorial Programmer

```
10 FORL=54272TO54296:POKEL,0:NEXTL:POKE54
   296,15:POKE54277,17
20 POKE54278,241
93 REM INITIALIZATION
94 POKE53280,1:POKE53281,1:LV=5:GOSUB1000
98 DIM A$(18),B$(18),M(18)
100 X=20:Y=11:SR=1024+X+40*Y:SD=171:SS=10
    2
101 WL=160:BR=214:BK=32:V1=5:V2=5
105 LN=40:VE=LN:DR=-LN:C=54272
115 LC=SR:PS=LC
130 PRINT"{CLR}{23 DOWN}{RIGHT}[4]{RVS}
     {OFF} HOLES LEFT"V1;
140 PRINT"{8 RIGHT}{BLU}{RVS}[+]{OFF} H
    OLES LEFT";V2
145 GOSUB5000
199 REM CHECK JOYSTICKS
200 K1=PEEK(56321):K2=PEEK(56320)
201 J1=15-(K1AND15):J2=15-(K2AND15)
203 F1=K1AND16:F2=K2AND16
221 IFJ1=1THENVE=-LN:GOTO230
223 IFJ1=2THENVE=LN:GOTO230
225 IFJ1=8THENVE=1:GOTO230
227 IFJ1=4THENVE=-1
230 IFJ2=1THENDR=-LN:GOTO300
233 IFJ2=2THENDR=LN:GOTO300
236 IFJ2=8THENDR=1:GOTO300
239 IFJ2=4THENDR=-1
299 REM MOVE PLAYERS
300 FORSP=1TOLV:NEXTSP
301 LC=LC+VE:GOSUB7600
302 IFPEEK(LC)<>BKTHENP=1:GOTO6000
304 IFF1=16ORV1=0THEN307
306 POKELC,BK:V1=V1-1:POKE1958,V1+48:GOTO
    308
307 POKELC+C,11:POKELC,WL
308 PS=PS+DR
309 IFPEEK(PS)<>32THENP=2:GOTO6000
310 IFF2=16ORV2=0THEN314
311 POKEPS,BK:V2=V2-1:POKE1981,V2+48
313 GOTO315
314 POKEPS+C,6:POKEPS,SS
315 GOTO200
1000 GOSUB7502:PRINT"{5 DOWN}{7 RIGHT} PR
     ESS TRIGGER TO CONTINUE"
1010 F1=PEEK(56321)AND16:F2=PEEK(56320)AN
     D16:IFF1=16 AND F2=16 THEN1010
1018 GOSUB7510:RETURN
4999 REM DRAW BORDER
5000 FORI=1024TO1063:POKEI+C,9:POKEI,SD:N
     EXT
5002 FORI=1904TO1943:POKEI+C,9:POKEI,SD:N
     EXT
5004 FORI=1024TO1904STEP40:POKEI+C,9:POKE
     I,BR:NEXT
5005 FORI=1063TO1943STEP40:POKEI+C,9:POKE
     I,BR:NEXT
5008 RETURN
5999 REM END OF GAME ROUTINE
6000 GOSUB6030:PRINT"{CLR}{10 DOWN}
     {14 RIGHT}[2]PLAYER{RIGHT}";
6002 IFP=1THENPOKE1445,SS:POKE1445+54272,
     6
6004 IFP=2THENPOKE1445,WL:POKE1445+54272,
     11
6006 PRINT"{2 RIGHT}WINS":FORI=1TO700:NEX
     TI
6008 GOSUB7000:PRINT"{8 DOWN}{7 RIGHT}TRI
     GGER TO CONTINUE:{RVS}{BLK}Q-QUIT
     {OFF}{RED}"
6009 POKE198,0:F1=PEEK(56321)AND16:F2=PEE
     K(56320)AND16
6010 IFPEEK(197)=62THENPOKE198,0:END
6012 IFF1=16ANDF2=16THEN6009
6013 GOTO100
6029 REM EXPLOSION
6030 W=54276:A=54277:H=54273
```

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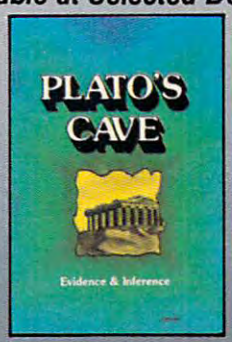

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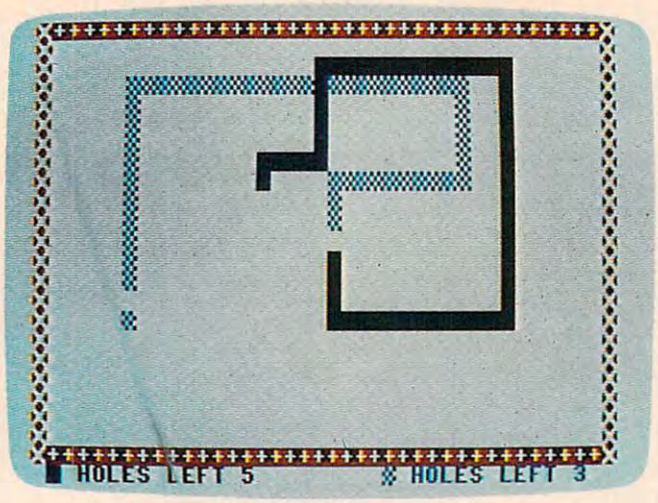

64 Version of "Barrier Battle."

```
6035 POKEW,129:POKEA,15:POKEH,40:POKEC,20
     0:FORI=1TO500:NEXT
6040 POKEW,128:POKEA,0:RETURN
7000 PRINT"{CLR}{8 DOWN}{15 RIGHT}GAME OV
     ER{OFF}"
7005 RESTORE
7006 FORT=1TO18:READM(T):NEXT
7007 FORT=1TO9:READL(T):NEXT
7010 FORI=1TO5
7020 FORJ=1TO9:POKEL(J)+C,9:POKEL(J),M(J)
     :NEXT
7030 FORK=1TO9:POKEL(K)+C,9:POKEL(K),M(K+
     9):NEXT:NEXT
7050 DATA32,81,32,78,160,77,122,32,76,77,
     81,78,32,160,32,122,32,76
7060 DATA1482,1483,1484,1522,1523,1524,15
     62,1563,1564
7070 RETURN
7502 PRINT"{CLR}{14 RIGHT}{3 DOWN}{RVS}
     {BLU}BARRIER BATTLE{OFF}{4 DOWN}"
7504 PRINT"{4 RIGHT}USING YOUR JOYSTICK,
     {SPACE}CAUSE YOUR"
7505 PRINT"{4 RIGHT}OPPONENT TO COLLIDE W
     ITH A WALL."
7506 PRINT"{DOWN}{4 RIGHT}YOU HAVE 5 HOLE
     S TO USE. CREATE"
7507 PRINT"{4 RIGHT}HOLES BY PRESSING THE
      TRIGGER."
7508 RETURN
7510 PRINT"{CLR}{9 DOWN}{10 RIGHT}SPEED L
     EVEL (1-4) ?"
7512 PRINT"{2 DOWN}{11 RIGHT}(1 IS THE FA
     STEST)"
7513 GETS$:IFS$=""THEN7513
7515 SK=VAL(S$):IFSK<1ORSK>4THEN7513
7520 LV=(SK-1)*10:RETURN
7600 POKE54276,17:X1=PEEK(162):X2=PEEK(16
     2)
7610 POKE54273,X1:POKEC,X2
7620 POKE54276,16:RETURN
```

Program 4: TRS-80 Barrier Battle

Translation by Jeff Hamdani, Editorial Programmer

```
93 REM INITIALIZATION
94 CLS:LV=5:GOSUB1000
100 CLS:X=16:Y=8:SR=1024+X+32*Y:SD=
    249:BR=246
101 WL=175:SS=159:BK=96:V1=5:V2=5
105 U=1:LN=32:VE=LN:DR=-LN
115 LC=SR:PS=SR
126 CLS:PRINT@1,CHR$(175);"HOLES";V
    1:PRINT@22,CHR$(159);"HOLES";V2
127 GOSUB 5000:IFU=1 THEN 300
199 REM JOYSTICK ROUTINE
200 H0=JOYSTK(0):H1=JOYSTK(1):H2=JO
    YSTK(2):H3=JOYSTK(3)
210 H0=INT(H0/2):H1=INT(H1/4):H2=IN
    T(H2/2):H3=INT(H3/4):I=0
215 IF H1<=3 AND H1>=0 AND H0>2 THE
    N VE=-LN :GOTO 235
220 IF H1>=13 AND H1<=15 AND H0<29
    THEN VE=LN:GOTO 235
225 IF H0>22 THEN VE=1:GOTO 235
230 IF H0<9 THEN VE=-1
235 IF H3<=3 AND H3>=0 AND H2>2 THE
    N DR=-LN:GOTO 300
240 IF H3>=13 AND H3<=15 AND H2<29
    THEN DR=LN:GOTO 300
245 IF H2>22 THEN DR=1:GOTO 300
250 IF H2<9 THEN DR=-1
299 REM MOVE PLAYERS
300 FORSP=1TOLV:NEXTSP
301 LC=LC+VE:Q1=PEEK(LC):GOSUB7600
302 IF Q1 <> BK THEN 6000
304 B1=PEEK(65280):IF B1=126 OR B1=
    254 OR B1=124 OR B1=252 THEN 30
    6 ELSE 307
306 POKELC,BK:V1=V1-1:IF V1>=0 THEN
     POKE 1032,V1+112:GOTO 308
307 POKELC,WL
308 PS=PS+DR:Q2=PEEK(PS):SOUND X,1
309  IF Q2 <> BK THEN 6010
310 B2=PEEK(65280):IF B2=125 OR B2=
    253 OR B2=124 OR B2=252 THEN 31
    2 ELSE 313
312 POKEPS,BK:V2=V2-1:IF V2>=0 THEN
     POKE 1053,V2+112:GOTO 315
313 POKEPS,SS
315 U=U+1:GOTO200
1000 GOSUB7502:PRINT@452,"PRESS TRI
     GGER TO START"
1010 B1=PEEK(65280):IF B1=126 OR B1
     =254 OR B1=124 OR B1=252 THEN1
     018
1012 B2=PEEK(65280):IF B2=125 OR B2
     =253 OR B2=124 OR B2=252 THEN
     1018 ELSE 1010
1018 GOSUB7510:RETURN
4999 REM DRAW BORDERS
5000 FORI=1056TO1087:POKEI,SD:NEXTI
5002 FORI=1504TO1535:POKEI,SD:NEXTI
5004 FORI=1056TO1504STEP32:POKEI,BR
     :NEXTI
5005 FORI=1087TO1535STEP32:POKEI,BR
     :NEXTI
5008 RETURN
6000 GOSUB 6030:CLS:PRINT@233,"PLAY
     ER ";CHR$(159);" WINS";:FORI=1
     TO700:NEXTI:GOTO6015
6010 GOSUB 6030:CLS:PRINT@233,"PLAY
     ER ";CHR$(175);" WINS";:FORI=1
     TO700:NEXTI:GOTO6015
6015 PRINT@161,"<C> OR <FIREBUTTON>
      TO CONTINUE"
6016 PRINT@193,"<S> CHANGE SPEED &
     CONTINUE"
6017 PRINT@225,"<Q> QUIT"
6018 PRINT@326,"CHOOSE YOUR OPTION"
6020 A$=INKEY$:IF A$="" THEN 6021 E
     LSE 6023
```

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Notes For Commodore 64, VIC-20, TRS-80 Color Computer, And Apple Versions

Jeff Hamdani, Editorial Programmer

In "Barrier Battle," you must maneuver your barrier in an effort to contain your opponent. The fire button on the joystick (or the space bar for the versions using keyboard) allows you to leave spaces (holes) within your barrier. Clever use of this feature lets you corner your opponent and still leave yourself a means of escape. You can create a maximum of five holes in each game.

The VIC and 64 versions of Barrier Battle are similar to the Atari version. However, in the Commodore versions, the characters are not redefined. Instead, the existing graphic characters are used to draw the borders and the barriers. After you or your opponent crashes, the winner is picked, and you are asked if you want to continue or quit. To continue, press the trigger button on your joystick, or press the Q key to quit. Since only one joystick can be used on the VIC-20, the second player must use keys I, J, K, and M to move up, left, right, and down, respectively.

Like the Commodore versions, the TRS-80 Color Computer version draws the barrier with existing graphic characters. In this version, use the left and right joysticks and their fire buttons for movement and spacing, respectively.

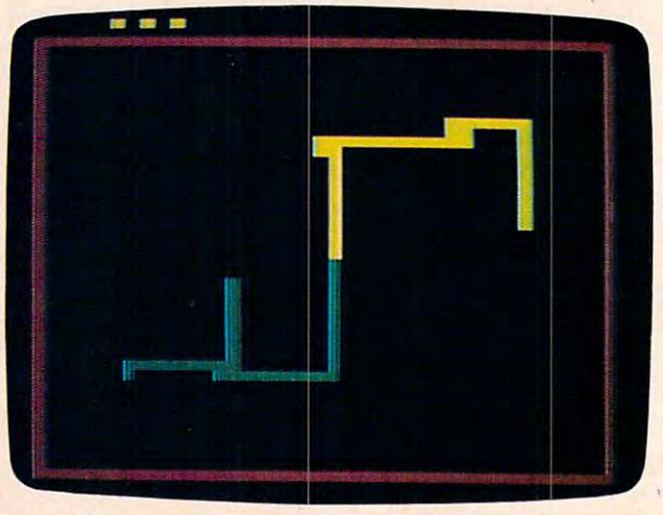
Unlike the other versions, Barrier Battle on the Apple is over when you or your opponent wins four rounds. The barriers are drawn on the low-resolution graphics screen. Paddles were chosen to control each player's movement. Direction is based upon the change of the values in functions PDL(0) and PDL(1). A positive change of more than eight units will move you to the right. A negative change of more than eight units will turn you to the left. If you find that the paddles are too sensitive (or not sensitive enough), increase or decrease this number (8) in lines 340 and 400 to suit you.

```
6021 B1=PEEK(65280):IF B1=126 OR B1
     =254 OR B1=124 OR B1=252 THEN
     100
6022 B2=PEEK(65280):IF B2=125 OR B2
     =253 OR B2=124 OR B2=252 THEN1
     00ELSE 6020
6023 IF A$="C" THEN 100
6024 IF A$="S" THEN GOSUB 1018:GOTO
      100
6025 IF A$="Q" THEN END
6026 IF A$<>"C" OR A$<>"S" OR A$<>"
     Q" THEN6015
6030 SOUND 178,5:SOUND 250,4:SOUND
     252,3:SOUND 255,2:RETURN
7502 PRINTTAB(7)"**BARRIER BATTLE**
     ":PRINT:PRINT
7504 PRINTTAB(2)"BARRICADE YOUR OPP
     ONENT INTO{4 SPACES}A COLLISIO
     N WITH A WALL.":PRINT:PRINT
7505 PRINTTAB(2)"YOU HAVE FIVE HOLE
     S TO USE.{5 SPACES}THESE CAN B
     E CREATED BY"
7506 PRINTTAB(2)"PRESSING THE TRIGG
     ER.":RETURN
7510 CLS:PRINT@230,"SPEED LEVEL (1-
     4)":PRINT@295,"(1 IS FASTEST)"
7511 S$=INKEY$:IF S$="" THEN 7511
7512 SK=VAL(S$):IF SK<1 OR SK>4 THE
     N 7511
7515 LV=(SK-1)*10:RETURN
7600 X=RND(50)
7610 SOUND X, 1:RETURN
```

Program 5: Apple Barrier Battle

Version by Chris Poer, Editorial Programmer

```
10  TEXT : HOME :PI = 3.1415927 / 180
20 A = 0:B = 0
30  GOSUB 660
40  REM  INITIALIZATION
50 FIR = 0:SEC = 0
60 XLOC = 20:YLOC = 26:ALOC = 20:BLAC =
     25:AVAR = 0:BVAR =  - 1
70 T1 = 0:T2 = 180:XVAR = 0:YVAR = 1
80 S = 0:T = 0
90  REM  PADDLE SETTING
100  PRINT : PRINT "NOW SET YOUR PADDLE
      ON THE CENTER VALUE OF 125": PRINT
     : PRINT : PRINT
110  VTAB 22: PRINT ,"   ";: HTAB 1: PRINT
     B$;" IS AT": VTAB 22: PRINT , PDL
     (1)
120  VTAB 23: PRINT ,"   ";: HTAB 1: PRINT
     A$;" IS AT": VTAB 23: PRINT , PDL
     (0)
```



Players have gone opposite ways in the Apple version of "Barrier Battle."

```
130  IF  PDL (1) < 123 OR  PDL (1) > 12
     7 OR  PDL (0) < 122 OR  PDL (0) >
     127 THEN 110
140  PRINT " HIT A PADDLE BUTTON TO CON
     TINUE"
150  IF  PEEK ( - 16287) < 128 AND  PEEK
     ( - 16286) < 128 THEN 150
160 N1 =  PDL (1):N2 =  PDL (0)
170  HOME
180  REM  SET SCREEN
190  GR : HOME : POKE  - 16302,0: CALL
      - 1998
200  COLOR= 1: HLIN 0,39 AT 4: HLIN 0,3
     9 AT 47: VLIN 47,4 AT 0: VLIN 47,4
      AT 39
210  COLOR= 13: FOR I = 1 TO 10 STEP 2:
      PLOT I,2: NEXT
220  COLOR= 4: FOR I = 20 TO 29 STEP 2:
      PLOT I,2: NEXT
230  COLOR= 13: PLOT ALOC,BLOC: COLOR=
     4: PLOT XLOC,YLOC
240  FOR I = 1 TO 300: NEXT
250  GOTO 330
260  REM  MOVE PLAYERS
270  COLOR= 13
280  IF S < 5 AND  PEEK ( - 16286) > 12
     7 THEN  COLOR= 0:S = S + 1: PLOT S
      * 2 - 1,2
290  PLOT ALOC,BLOC
300  COLOR= 4
310  IF T < 5 AND  PEEK ( - 16287) > 12
     7 THEN T = T + 1: COLOR= 0: PLOT 1
     8 + (T * 2),2
320  PLOT XLOC,YLOC
330 O1 = N1:N1 =  PDL (0):O2 = N2:N2 =
      PDL (1)

340  IF  ABS (O1 - N1) < 8 THEN 390
350 S1 =  SGN (O1 - N1)
360  IF S1 = 1 THEN T1 = T1 + 90: GOTO
     380
370 T1 = T1 - 90
380 XVAR =  INT ( SIN (T1 * PI) + .1):Y
    VAR =  INT ( COS (T1 * PI) + .1)
390 XLOC = XLOC + XVAR:YLOC = YLOC + YV
    AR
400  IF  ABS (O2 - N2) < 8 THEN 450
410 S2 =  SGN (O2 - N2)
420  IF S2 = 1 THEN T2 = T2 + 90: GOTO
     440
430 T2 = T2 - 90
440 AVAR =  INT ( SIN (T2 * PI) + .1):B
    VAR =  INT ( COS (T2 * PI) + .1)
450 ALOC = ALOC + AVAR:BLOC = BLOC + BV
    AR
460 PNT =  SCRN( XLOC,YLOC):POT =  SCRN(
    ALOC,BLOC)
470  IF PNT = 0 AND POT = 0 THEN  FOR I
      = 1 TO LEV: GOTO 270
480  IF PNT = 4 OR PNT = 1 OR PNT = 13 THEN
    FIR = 1
490  IF POT = 4 OR POT = 13 OR POT = 1 THEN
    SEC = 1
500  FOR I = 1 TO 1000: NEXT
510  REM  DETERMINING WINNER
520  GOSUB 790: TEXT : HOME
530  IF FIR = 1 AND SEC = 1 THEN  PRINT
     "IT WAS A TIE": GOTO 560
540  IF FIR = 1 THEN B = B + 1: PRINT B
     $;" WON THIS ROUND": GOTO 560
550 A = A + 1: PRINT A$;" WON THIS ROUN
    D"
560  PRINT "THE SCORE IS ": PRINT B;" V
     ICTORIES FOR ";B$
570  PRINT A;" VICTORIES FOR ";A$
580  IF B = 4 THEN C$ = B$: GOTO 630
590  IF A = 4 THEN C$ = A$: GOTO 630
600  PRINT "HIT YOUR PADDLE BUTTON TO C
     ONTINUE"
610  IF  PEEK ( - 16287) > 127 OR  PEEK
     ( - 16286) > 127 THEN 40: GOTO 620

620  GOTO 610
630  PRINT : PRINT : PRINT C$;" IS THE
     WINNER"
640  END
650  IF  PEEK ( - 16287) > 127 OR  PEEK
     ( - 16286) > 127 THEN 40: GOTO 650

660  INVERSE : HTAB 15: PRINT "BARRIER
     BATTLE"
670  NORMAL : PRINT : PRINT : PRINT "TH
     E OBJECT OF THE GAME IS TO FORCE Y
     OUR OPPONENT INTO A WALL."
680  PRINT : PRINT "YOU CANNOT RUN INTO
      YOUR OWN WALL OR THE";: PRINT "BO
     UNDARY."
690  PRINT : PRINT "YOU CAN MAKE FIVE H
     OLES IN THE WALL PER ROUND BY PRES
     SING THE BUTTON ON YOUR": PRINT "P
     ADDLE.": PRINT : PRINT "THE NUMBER
      OF HOLES YOU HAVE LEFT IS": PRINT
     "SHOWN AT THE TOP OF THE SCREEN."
700  PRINT : PRINT "THE FIRST MAN TO WI
     N FOUR ROUNDS WINS": PRINT "THE GA
     ME."
710  PRINT : PRINT "WHAT SPEED DO YOU W
     ANT (1-4) ? <4 IS THE";: PRINT "FA
     STEST>": INPUT LEV
720 LEV = (4 / LEV - 1) * 40
730  PRINT "WHO IS PLAYER ONE": INPUT B
     $
740  PRINT "WHO IS PLAYER TWO": INPUT A
     $
750  HOME
760  PRINT : PRINT B$;" IS ON TOP AND U
     SES PADDLE 1": PRINT A$;" IS UNDER
     NEATH AND USES PADDLE 0"
770  RETURN
780  REM  NOISE
790  FOR I = 1 TO 40
800 F =  PEEK ( - 16336)
810  NEXT
820  RETURN
```

©

TRIDENT

C. O. Dickerson

Join the crew of the USS Trident *as they test their skills to the limit in a naval simulation. As missile officer, you have only a limited arsenal available to stop wave after wave of enemy missiles. Joystick required for Atari and 64. The 64 version must be entered using MLX (presented elsewhere in this issue). See the "Automatic Proofreader" article on page 60 before typing in this program.*

You are missile officer aboard the *USS Trident*, the world's newest and most powerful nuclear submarine. Suddenly, the Priority One Channel signals a red alert: The enemy has launched an all-out attack.

You don't know it, but this is actually a drill. Since the *Trident* is completely computerized, your only information on the world outside the sub comes from your status console. It's a simple enough matter to keep missile officers like you on their toes: Program the computers to simulate an attack.

You're not only fighting for your theoretical country, but for that next promotion, too!

The enemy missiles come in waves, increasing in number and speed with each new attack. You must meet this massive assault alone, matching the speed and power of your computer against an onslaught of simulated juggernauts. Your defensive missiles can hover in ambush or rocket through the atmosphere at twice the speed of anything the enemy can launch against you. But even with such weapons at your disposal, you know that lightning reflexes and all your skill will be required to repel the attack.

Inside The *Trident* Computer

"Trident" is an arcade-style game making extensive use of machine language. It will run in 24K RAM on the Atari. Three machine language routines are used, stored in a string. A$ contains "Textplot II" by Mark Grebe (COMPUTE!, December 1982); it is used to place numerical data in the various screen readouts. M$ contains D. K. Titchenell's MOV$ (COMPUTE!, March 1983). This routine speeds up initialization and clears the P/M graphics area. The third routine, stored in D$, is the actual game routine. It reads the joystick, keeps track of the incoming missiles, homes them in on the target, handles their movement, and detects collision.

If all is well, D$ returns a 17 PEEK(207), directing the program to reexecute the routine. A 16 indicates a missile has gotten through and the game is over. A value of 1–15 is returned when an incoming missile is destroyed. This number is used to indicate which missiles were destroyed and to compute the score.

Because this program does make extensive use of machine language, a five-line BASIC routine is included (beginning at line 1000) to aid in verifying each DATA line. After entering the program and before typing RUN, type GOTO 1000. If screen output matches the chart below, DATA statements have been entered correctly; you can delete lines 1000–1020 and RUN the program. If there is a discrepancy, the line with the incorrect DATA will be indicated by the number to the left.

Line No.	Check No.	Line No.	Check No.
515	4701	585	3829
520	4304	590	4282
525	4139	595	4278
530	4147	600	4378
535	4403	605	4480
540	4417	610	4003
545	4465	615	4648
550	4191	620	4718
555	4416	625	4685
560	4733	630	4365
565	4620	635	1094
570	4609	640	4931
575	4714	645	2326
580	2841		

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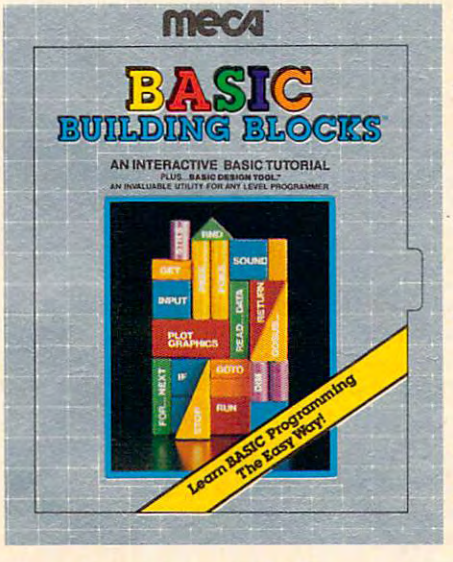

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Launching Your Missile

To stop the incoming wave of enemy missiles, release an antimissile from your base (centered in the radar grid) by pressing the fire button on joystick 1. Use the joystick to direct the antimissile toward the nearest incoming missile as shown on the radar screen. Once you have picked off the incoming missile, you are ready to release another antimissile from your base. Be sure to keep your antimissiles on the radar grid.

If you destroy all missiles in an incoming wave, you move to a higher difficulty level where the frequency and speed of the missiles are increased. If you lose, start over by hitting the fire button.

Console Indicators (from top to bottom)

Number of antimissiles launched

Score

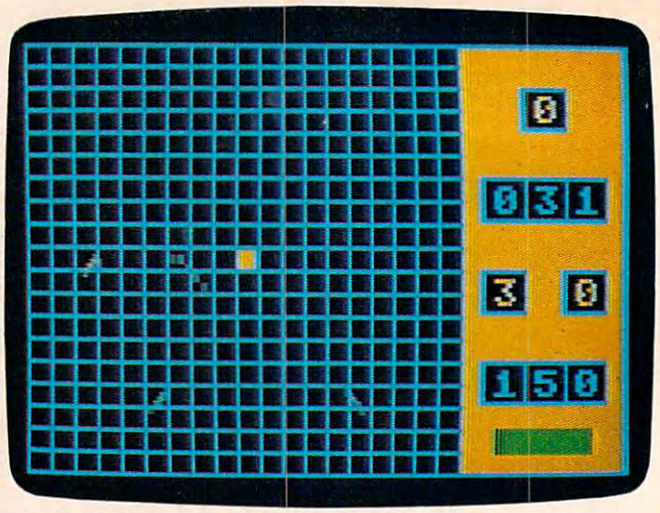
Number of missiles in the wave and number of missiles destroyed

Incoming missile speed

Scoring begins at two points for each incoming missile destroyed, increasing by one with each new speed level. A bonus is given for each antimissile not used during the wave. Thus, if each hit counts four points and you are able to destroy four incoming missiles using only three antimissiles, your score for that wave is 20 (4 points for each missile destroyed plus a bonus of 4 points for the antimissile you didn't use).

Program 1: Trident For Atari

```
BG 10  GRAPHICS 0:POKE 752,1:POSITION 1
       2,12:? "STANDBY PLEASE":Q=100:S=
       0:GOSUB 240:GOSUB 345:GOSUB 160:
       GOSUB 285
LI 15  REM MISSILE ALERT{17 SPACES}
NO 20  FOR I=1 TO 10:FOR D=30 TO 20 STE
       P -1:SOUND 0,D,10,8:NEXT D:NEXT
       I:Z=USR(ADR(A$),48+PEEK(1691),1,
       122,51)
BN 25  T=10-(Q/10):Z=USR(ADR(A$),T+48,2
       ,122,71):Z=USR(ADR(A$),53,2,133,
       71)
IF 30  POKE 1690,0:POKE 1692,0:POKE 203
       ,128:POKE 204,PM+1:POKE 208,105:
       POKE 209,61:POKE 53278,0:POKE 77
       ,0:C=0
EM 35  FOR I=1 TO PEEK(1691):POKE 53247
       +I,PEEK(1663+I):Z=USR(ADR(M$),16
       74,ST+384+I*128+PEEK(1667+I),4):
       NEXT I
EK 40  FOR I=1 TO 4*PEEK(1691)
BN 45  IF PEEK(710)=198 THEN POKE 704,1
       4:POKE 705,14:POKE 706,14:POKE 7
       07,14:POKE 710,52:SOUND 0,60,12,
       8:GOTO 55
LL 50  POKE 704,10:POKE 705,44:POKE 706
       ,202:POKE 707,106:POKE 710,198:S
       OUND 0,0,0,0
LG 55  FOR D=1 TO 100:NEXT D:NEXT I
EL 60  REM MAIN LOOP < LINES 55 & 60 >
       {3 SPACES}
```



Incoming missiles speed toward the base at center screen in the Atari version of "Trident."

```
LE 65  FOR D=0 TO Q:NEXT D
LO 70  Z=USR(ADR(D$)):POKE 53278,0:IF P
       EEK(207)=17 THEN 65
HC 75  IF PEEK(207)=16 THEN 320
ME 80  REM HIT ON MISSILE{16 SPACES}
DD 85  T=PEEK(207):IF T>7 THEN T=T-8:C=
       C+1:POKE 1667,0:Z=USR(ADR(M$),16
       84,ST+896+PEEK(1671),4)
EJ 90  IF T>3 THEN T=T-4:C=C+1:POKE 166
       6,0:Z=USR(ADR(M$),1684,ST+768+PE
       EK(1670),4)
EG 95  IF T>1 THEN T=T-2:C=C+1:POKE 166
       5,0:Z=USR(ADR(M$),1684,ST+640+PE
       EK(1669),4)
OG 100 IF T=1 THEN C=C+1:POKE 1664,0:Z
       =USR(ADR(M$),1684,ST+512+PEEK(1
       668),4)
KJ 105 Z=USR(ADR(M$),M,M+1,128):FOR I=
       15 TO 0 STEP -0.5:SOUND 0,10,10
       ,I:NEXT I:Z=USR(ADR(A$),48+C,1,
       144,51)
PP 110 Z=USR(ADR(A$),PEEK(1692)+48,1,1
       33,11):POKE 203,128:POKE 204,PM
       +1:POKE 208,105:POKE 209,61
HJ 115 Z=USR(ADR(M$),M,M+1,640):IF C=P
       EEK(1691) THEN 130
AB 120 POKE 53278,0:GOTO 70
GP 125 REM INCREASE NUMBER/SPEED
       {8 SPACES}
IK 130 Z=(C-PEEK(1692)+C)*((120-Q)/10)
       :S=S+Z:T1=INT(S/100):I=S-T1*100
       :T2=INT(I/10):T3=S-T1*100-T2*10
EI 135 Z=USR(ADR(A$),T1+48,2,122,31):Z
       =USR(ADR(A$),T2+48,2,133,31):Z=
       USR(ADR(A$),T3+48,2,144,31)
CL 140 FOR D=1 TO 500:NEXT D:POKE 1691
       ,PEEK(1691)+1:IF PEEK(1691)=5 T
       HEN POKE 1691,1:Q=Q-10:IF Q<0 T
       HEN 320
DA 145 Z=USR(ADR(A$),48,1,122,51):Z=US
       R(ADR(A$),48,1,144,51):Z=USR(AD
       R(A$),48,2,122,71):Z=USR(ADR(A$
       ),48,2,133,71)
HJ 150 Z=USR(ADR(A$),48,1,133,11):GOSU
       B 285:GOTO 20
GH 155 REM DRAW PLAYFIELD{15 SPACES}
EM 160 GRAPHICS 23:POKE 559,0:POKE 708
       ,42:POKE 709,152:POKE 710,198:P
       OKE 712,2
```

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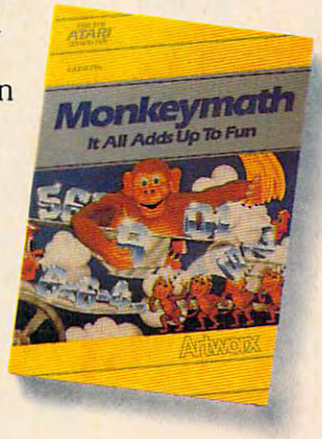

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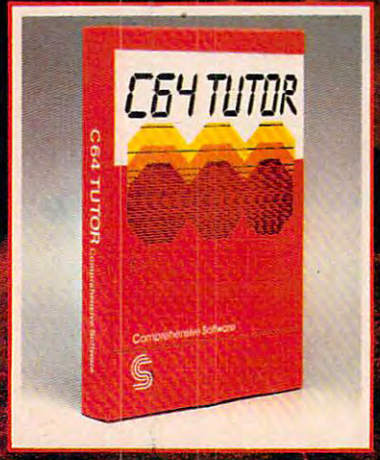
BREATHE LIFE INTO YOUR C64



Now that you have it, put it to work. C64 TUTOR puts you in charge with a Commodore 64 tutorial, screen display editor, sprite editor, music synthesizer & programmer's calculator.

Use the tutorial to learn what your Commodore 64 can do. And how to do it. Create, edit & save one page of letters and/or pictures with the screen display editor. Enter sprites from the Commodore Manual. Or make up your own. Then edit and save them using the sprite editor. Sprite creation is quick, and easy. Play music with the music synthesizer. Use the programmer's calculator to add, subtract, multiply & divide in decimal, hexadecimal and binary. Includes AND, OR, XOR, Shift and 1's complement functions.

Great for new users. C64 TUTOR cures computerphobia and promotes computer literacy.

Take it from me, with a little power, the possibilities are endless.

Available for $29.95 at your computer dealer.

Comprehensive Software Support,

2316 Artesia Bl. Suite B.
Redondo Beach, CA 90278
213/318-2561

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IE 165 COLOR 2:PLOT 114,95:DRAWTO 159,
       95:DRAWTO 159,0:DRAWTO 114,0:PO
       SITION 114,95:POKE 765,1
BB 170 XIO 18,#6,0,0,"S:":FOR I=0 TO 1
       14 STEP 6:PLOT I,0:DRAWTO I,95:
       NEXT I:FOR I=0 TO 95 STEP 5:PLO
       T 0,I
DL 175 DRAWTO 114,I:NEXT I:PLOT 131,10
       :DRAWTO 142,10:DRAWTO 142,19:DR
       AWTO 131,19:DRAWTO 131,10:PLOT
       120,30
NP 180 DRAWTO 153,30:DRAWTO 153,39:DRA
       WTO 120,39:DRAWTO 120,30:PLOT 1
       31,30:DRAWTO 131,39:PLOT 142,30
       :DRAWTO 142,39
OH 185 PLOT 120,50:DRAWTO 131,50:DRAWT
       O 131,59:DRAWTO 120,59:DRAWTO 1
       20,50:PLOT 142,50:DRAWTO 153,50
       :DRAWTO 153,59
PB 190 DRAWTO 142,59:DRAWTO 142,50:PLO
       T 120,70:DRAWTO 153,70:DRAWTO 1
       53,79:DRAWTO 120,79:DRAWTO 120,
       70:PLOT 131,70
DF 195 DRAWTO 131,79:PLOT 142,70:DRAWT
       O 142,78:X=132:Y=11:GOSUB 230:X
       =121:Y=31:GOSUB 230:X=132:Y=31:
       GOSUB 230
OM 200 X=143:Y=31:GOSUB 230:X=121:Y=51
       :GOSUB 230:X=143:Y=51:GOSUB 230
       :X=121:Y=71:GOSUB 230:X=132:Y=7
       1:GOSUB 230
EK 205 X=143:Y=71:GOSUB 230:COLOR 1:FO
       R I=46 TO 49:PLOT 55,I:DRAWTO 5
       9,I:NEXT I:COLOR 3
NO 210 FOR I=85 TO 90:PLOT 124,I:DRAWT
       O 149,I:NEXT I
DN 215 Z=USR(ADR(A$),48,1,133,11):Z=US
       R(ADR(A$),48,2,122,31)
CG 220 Z=USR(ADR(A$),48,2,133,31):Z=US
       R(ADR(A$),48,2,144,31):Z=USR(AD
       R(A$),48,1,122,51):Z=USR(ADR(A$
       ),48,1,144,51)
PN 225 Z=USR(ADR(A$),48,2,122,71):Z=US
       R(ADR(A$),48,2,133,71):Z=USR(AD
       R(A$),48,2,144,71):POKE 559,46:
       RETURN
AA 230 COLOR 0:FOR I=Y TO Y+7:PLOT X,I
       :DRAWTO X+9,I:NEXT I:RETURN
BK 235 REM INITIALIZE...{16 SPACES}
BM 240 DIM A$(354),D$(241),M$(39),N$(1
       6),T$(9)
LC 245 FOR I=1 TO 354:READ A:A$(I,I)=C
       HR$(A):NEXT I:FOR I=1536 TO 155
       7:READ A:POKE I,A:NEXT I
BD 250 FOR I=1 TO 241:READ A:D$(I,I)=C
       HR$(A):NEXT I:FOR I=1 TO 39:REA
       D A:M$(I,I)=CHR$(A):NEXT I
HG 255 T$="{INVERSE}TRIDENT{NORMAL}":N$="{16 SPACES}":
       POKE 1664,0:Z=USR(ADR(M$),1664,
       1665,44)
OM 260 PM=PEEK(106)-24:ST=PM*256:POKE
       ST,0:Z=USR(ADR(M$),ST,ST+1,1024
       ):POKE 54279,PM:POKE 53277,3:M=
       ST+384
DP 265 POKE 1675,24:POKE 1676,24:POKE
       1680,255:POKE 1681,255:POKE 168
       4,24:POKE 1685,60:POKE 1686,60:
       POKE 1687,24
CE 270 POKE 1691,1:POKE 623,1:POKE 170
       1,0:POKE 1702,128:POKE 1703,0:P
       OKE 1704,128:POKE 1705,PM+2:POK
       E 1706,PM+2
DN 275 POKE 1707,PM+3:POKE 1708,PM+3:R
       ETURN
JH 280 REM SELECT RANDOM MISSILE POSI
       TS
KH 285 FOR I=1 TO PEEK(1691):Z=INT(4*R
       ND(0)+1):ON Z GOTO 290,295,300,
       305
BL 290 POKE (1667+I),16:POKE (1663+I),
       INT(112*RND(0)+46):GOTO 310
CK 295 POKE (1663+I),157:POKE (1667+I)
       ,INT(92*RND(0)+16):GOTO 310
EF 300 POKE (1667+I),108:POKE (1663+I)
       ,INT(112*RND(0)+46):GOTO 310
OI 305 POKE (1663+I),46:POKE (1667+I),
       INT(92*RND(0)+16)
DG 310 NEXT I:RETURN
KD 315 REM END OF GAME{18 SPACES}
OP 320 Z=USR(ADR(M$),M,M+1,640):POKE 5
       3761,143:FOR I=255 TO 0 STEP -1
       :POKE 712,I:POKE 53760,I:NEXT I
       :POKE 53761,0
KE 325 POKE 1691,1:Q=100:S=0:FOR I=0 T
       O 7:POKE 53248+I,0:POKE 1664+I,
       0:NEXT I:POKE 77,254
PH 330 IF PEEK(53279)<>6 AND STRIG(0)
       THEN 330
BE 335 GOSUB 215:GOSUB 285:POKE 77,0:G
       OTO 20
LH 340 REM GAME TITLE{19 SPACES}
AI 345 GRAPHICS 7:POKE 710,146:POKE 71
       2,146:POKE 709,42:POKE 752,1:PO
       KE 559,0:COLOR 2
CA 350 FOR I=1 TO 9:Z=USR(ADR(A$),ASC(
       T$(I,I)),2,15+I*8,15):NEXT I:PL
       OT 21,15:DRAWTO 23,15
KG 355 PLOT 17,16:DRAWTO 23,16:PLOT 13
       ,17:DRAWTO 23,17:PLOT 11,18:DRA
       WTO 23,18:PLOT 11,19:DRAWTO 23,
       19:PLOT 13,20
FC 360 DRAWTO 23,20:PLOT 17,21:DRAWTO
       23,21:PLOT 21,22:DRAWTO 23,22:F
       OR I=0 TO 5:PLOT 80-I,10+I:DRAW
       TO 100-I,10+I
JD 365 NEXT I:FOR I=0 TO 5:PLOT 80-I,2
       8-I:DRAWTO 100-I,28-I:NEXT I:CO
       LOR 1:FOR I=0 TO 4:PLOT 110-2*I
       ,15+I
DL 370 DRAWTO 112+2*I,15+I:NEXT I:DRAW
       TO 159,19:FOR I=4 TO 0 STEP -1:
       PLOT 110-2*I,23-I:DRAWTO 112+2*
       I,23-I:NEXT I
LD 375 FOR I=1 TO 16:Z=USR(ADR(A$),ASC
       (N$(I,I)),2,7+I*8,45):NEXT I
NN 380 SOUND 0,60,4,4:? "{8 SPACES}PRE
       SS START TO BEGIN":? :? "
       {3 SPACES}PRESS OPTION FOR INST
       RUCTIONS":POKE 559,34
FA 385 IF PEEK(53279)=6 OR STRIG(0)=0
       THEN SOUND 0,0,0,0:RETURN
EL 390 T=T+1:POKE 708,T:IF T=255 THEN
       T=0
CE 395 IF PEEK(53279)=3 THEN SOUND 0,0
       ,0,0:GOTO 410
GN 400 GOTO 385
FM 405 REM INSTRUCTIONS ( MESSAGE FOR
       M )
JI 410 GRAPHICS 0:POKE 710,30:POKE 712
       ,30:POKE 752,1:? "{13 SPACES}-TR
       IDENT-{14 SPACES}":? :? :?
MF 415 ? "STANDBY FOR HIGH PRECEDENCE
       MESSAGE{13 SPACES}FROM PENTAGON"
       :FOR I=1 TO 10:FOR D=1 TO 25:SO
       UND 0,20,10,6
LG 420 NEXT D:FOR D=1 TO 25:SOUND 0,0,
       0,0:NEXT D:NEXT I:? "{CLEAR}"
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GC 425 ? "Z 152347Z JAN 87":? "FM CHIE
       F OF NAVAL OPERATIONS":? "TO US
       S TRIDENT (SSBN-12)":? "BT":?
NG 430 ? "{5 SPACES}R E D{3 SPACES}A L
        E R T{3 SPACES}D R I L L":? :?

DN 435 ? "1. HEAVY MISSILE ATTACK ON U
       SS TRIDENTIS IMMINENT. INTELLIG
       ENCE SOURCES"
NH 440 ? "INDICATE THAT ATTACK WILL OC
       CUR IN{4 SPACES}WAVES, INCREASI
       NG MISSILE NUMBER AND"
KC 445 ? "SPEED WITH EACH ATTACK.":? "
       2. YOU ARE DIRECTED TO PLACE YO
       UR{5 SPACES}BEST MISSILE OFFICE
       R AT THE DEFENSIVE"
DJ 450 ? "MISSILE CONSOLE. INSURE HE I
       S AWARE{3 SPACES}THAT USS TRIDE
       NT POSSESSES A LIMITED"
KK 455 ? "NUMBER OF ANTI-MISSILE MISSI
       LES. EXTRACREDIT WILL BE GIVEN
       FOR MULTIPLE{5 SPACES}KILLS ON
       ENEMY TARGETS.":?
CC 460 ? "press TRIGGER to continue wi
       th message";
AG 465 IF STRIG(0) THEN 465
JC 470 ? "{CLEAR}":? :? :? :? :? "3. I
       NFORM MISSILE OFFICER THAT UPPE
       R  INDICATOR OF CONSOLE WILL RE
       PORT"
EO 475 ? "NUMBER OF ANTI-MISSILES FIRE
       D, NEXT{3 SPACES}INDICATOR WILL
        REPORT SCORE. THE TWO"
JO 480 ? "INDICATORS BELOW THAT WILL R
       EPORT THE NUMBER OF ENEMY MISSI
       LES IN THE WAVE"
AF 485 ? "AND THE NUMBER DESTROYED. TH
       E FINAL{3 SPACES}INDICATOR WILL
        REPORT INCOMING ENEMY  MISSILE
        SPEED."
HN 487 ? "4. RELEASE MISSILES WITH THE
        FIRE{5 SPACES}BUTTON.  IF YOU
       SHOULD LOSE, HIT FIRE BUTTON FO
       R ANOTHER DRILL."
DF 490 ? "5. GOOD LUCK!!! YOUR COUNTRY
        DEPENDS  ON YOU. ADMIRAL IMA C
       OMPUTER SENDS.":? "BT":? :? :?
GO 495 ? "{7 SPACES}press TRIGGER to b
       egin{7 SPACES}"
PC 500 IF STRIG(0) THEN 500
HK 505 RETURN
LL 510 REM  DATA STATEMENTS - warning
       -{3 SPACES}machine language - t
       ype carefully{4 SPACES}
BC 515 DATA 104,240,10,201,4,240,13,17
       0,104,104,202,208,251,169,22,13
       3,185,76,64,185,104,133,195,104
       ,201,128
IB 520 DATA 144,4,41,127,198,195,170,1
       41,22,6,224,96,176,15,169,64,22
       4,32,144,2,169,224,24,109,22,6
OB 525 DATA 141,22,6,104,104,141,23,6,
       104,104,141,24,6,201,4,144,5,56
       ,233,4,176,247,133,214,201,0
OF 530 DATA 240,7,169,4,56,229,214,133
       ,214,78,24,6,78,24,6,6,214,24,1
       04,104,141,25,6,133,186,166
OK 535 DATA 87,169,10,224,3,240,8,169,
       20,224,5,240,2,169,40,133,207,1
       33,187,165,88,133,203,165,89,13
       3
PE 540 DATA 204,32,0,6,24,173,24,6,101
       ,203,133,203,144,2,230,204,24,1
       65,203,101,212,133,203,165,204,
       101
CJ 545 DATA 213,133,204,173,22,6,133,1
       87,169,8,133,186,32,0,6,165,212
       ,133,205,173,244,2,101,213,133,
       206
BD 550 DATA 160,0,162,8,169,0,133,209,
       133,208,177,205,69,195,72,104,1
       0,72,144,8,24,173,23,6,5,208
PJ 555 DATA 133,208,224,1,240,8,6,208,
       38,209,6,208,38,209,202,208,228
       ,104,152,72,160,0,132,215,132,2
       12
DC 560 DATA 166,214,240,88,56,38,215,2
       02,208,250,177,203,5,215,69,215
       ,145,203,165,215,73,255,133,215
       ,200,200
MG 565 DATA 177,203,5,215,69,215,145,2
       03,166,214,6,209,38,212,202,208
       ,249,160,0,24,177,203,101,212,1
       45,203
LH 570 DATA 169,8,56,229,214,170,132,2
       12,70,208,102,212,202,208,249,2
       40,2,208,135,160,2,24,177,203,1
       01,212
CF 575 DATA 145,203,24,165,208,101,209
       ,160,1,145,203,24,144,9,165,209
       ,145,203,200,165,208,145,203,10
       4,168,24
NA 580 DATA 165,203,101,207,133,203,14
       4,2,230,204,200,192,8,208,206,9
       6
LB 585 DATA 169,0,133,212,162,8,70,186
       ,144,3,24,101,187,106,102,212,2
       02,208,243,133,213,96
HC 590 DATA 104,169,17,133,207,162,0,1
       89,128,6,201,0,240,83,56,233,10
       2,48,5,222,128,6,208,3,254,128
HD 595 DATA 6,189,128,6,157,0,208,189,
       165,6,133,205,189,169,6,133,206
       ,189,132,6,56,233,63,48,5,222
MK 600 DATA 132,6,208,3,254,132,6,188,
       132,6,173,138,6,145,205,200,173
       ,139,6,145,205,200,173,140,6,14
       5
DF 605 DATA 205,200,173,141,6,145,205,
       189,4,208,201,1,208,5,169,16,13
       3,207,96,232,224,4,208,161,173,
       154
FE 610 DATA 6,201,1,240,11,169,1,205,1
       32,2,208,1,96,238,156,6,141,154
       ,6,173,120,2,201,14,208,4
NO 615 DATA 198,209,198,209,201,13,208
       ,4,230,209,230,209,201,11,208,4
       ,198,208,198,208,201,10,208,8,1
       98,208
CA 620 DATA 198,208,198,209,198,209,20
       1,9,208,8,198,208,198,208,230,2
       09,230,209,201,7,208,4,230,208,
       230,208
AE 625 DATA 201,6,208,8,230,208,230,20
       8,198,209,198,209,201,5,208,8,2
       30,208,230,208,230,209,230,209,
       165,208
MA 630 DATA 141,4,208,164,209,162,0,18
       9,142,6,145,203,200,232,224,6,2
       08,245,173,8,208,201,0,240,7,13
       3
PO 635 DATA 207,169,0,141,154,6,96
PH 640 DATA 104,104,133,215,104,133,21
       4,104,133,217,104,133,216,104,1
       33,218,104,170,160,0,177,214,14
       5,216,200,208
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