Telecommunications: How To Get Started

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The Leading Magazine Of Home, Educational, And Recreational Computing

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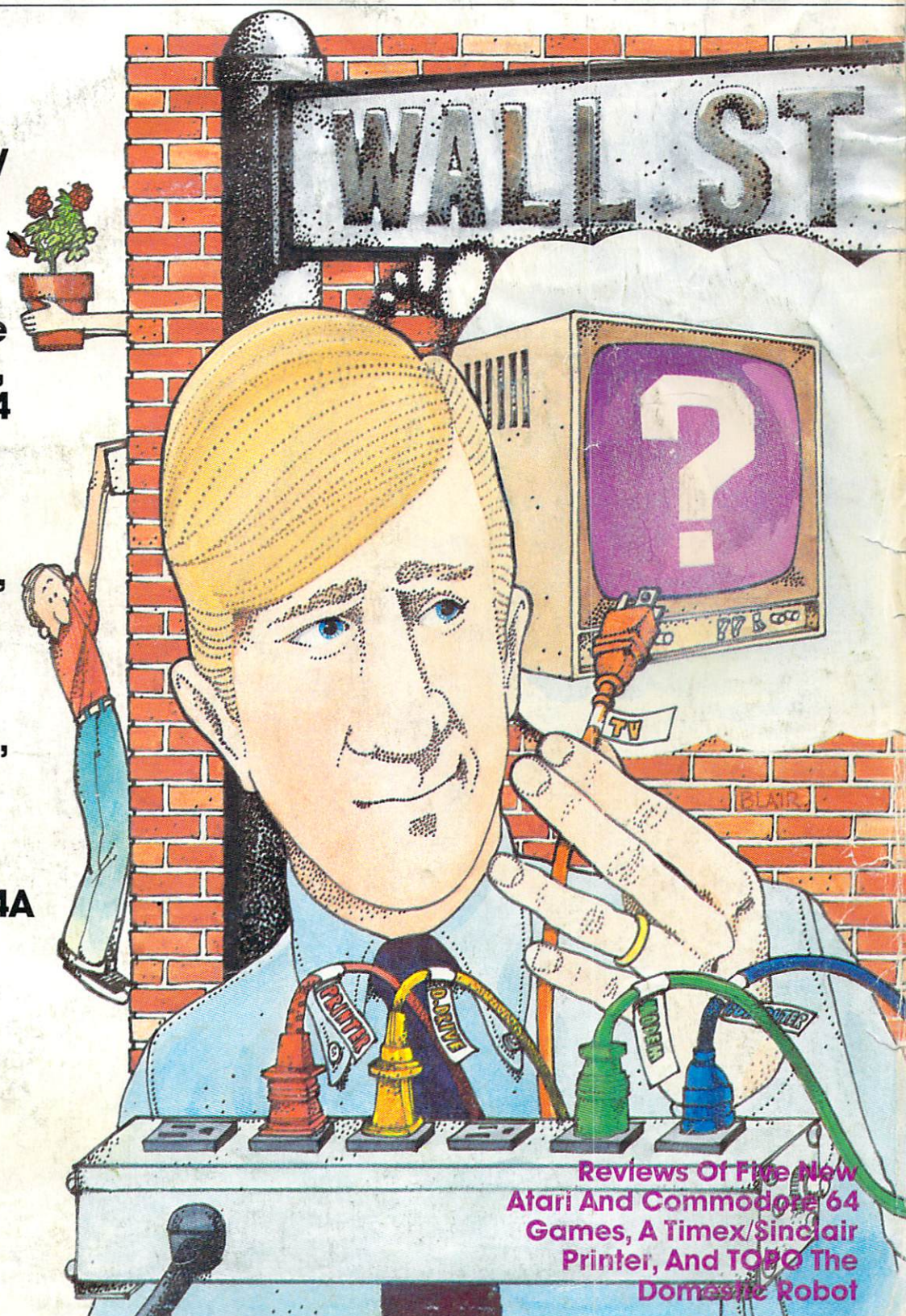
Stock Market Analyzer For VIC-20, Commodore 64, And Atari

All About The TI-99/4A Character Set



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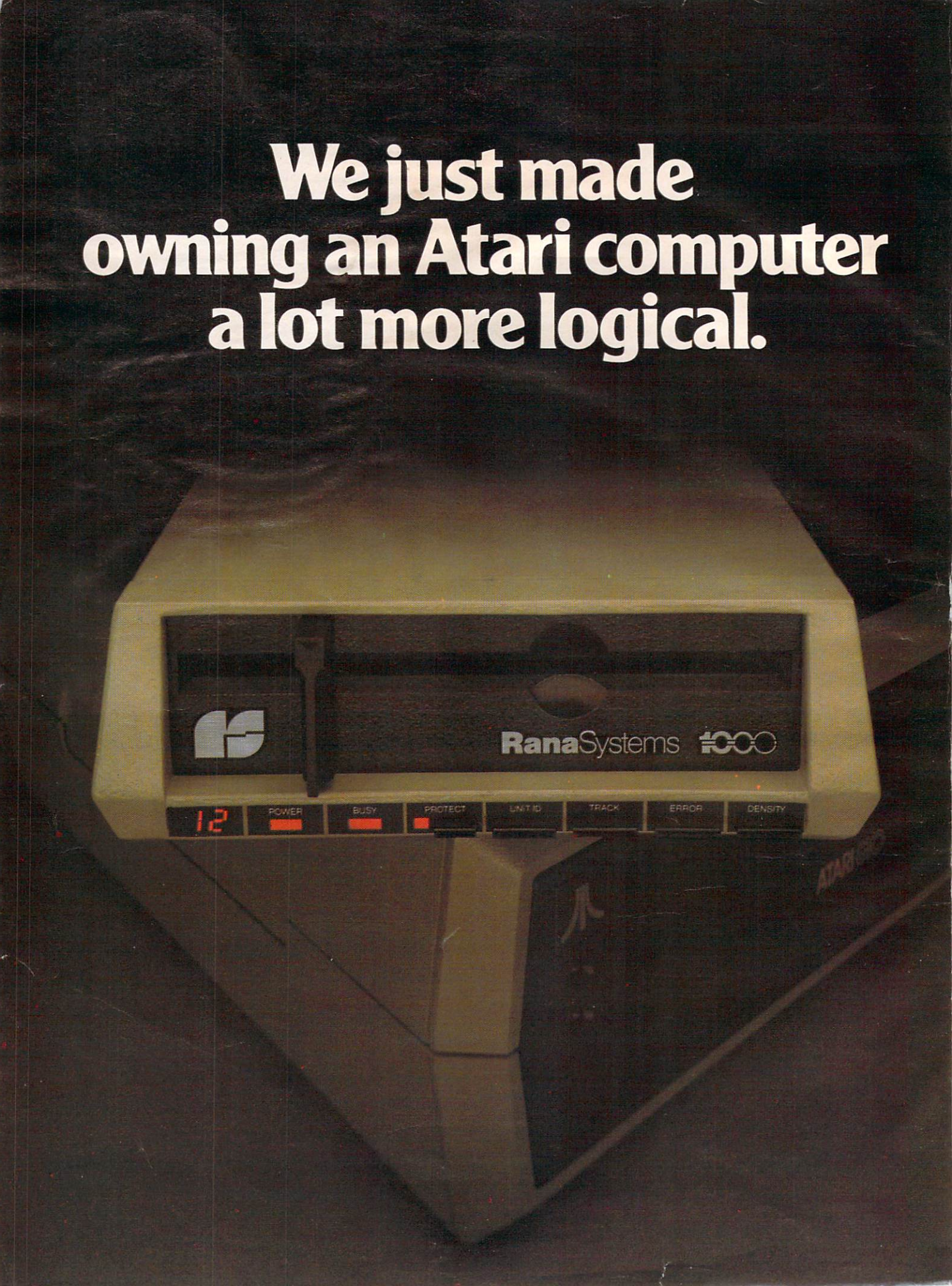

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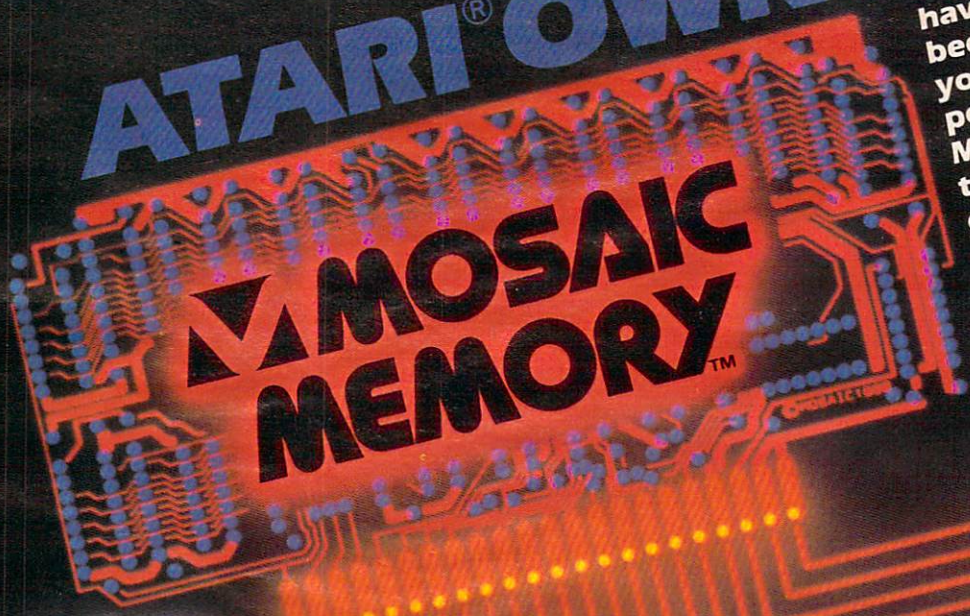

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EDITOR'S NOTES

A recent article in *Business Week* touched on the topic of decelerating sales in the home computer market. Not that sales are declining, mind you; they're just not accelerating with the velocity that many had predicted. One of the recurring questions raised was the value of home computers aside from their use as game machines. If you process words, then obviously a word processing package is of use to you. Perhaps you need a data management program or even a home accounting package. Beyond these uses, what can you do? Or are these uses intrinsically enough?

Our opinion is that there's a bit of a crisis of expectations involved, and perhaps an inch or two of gap between the reality of a basic system and the advertisements describing a fully configured system. It is, in fact, quite frustrating to discover that a home computer may cost you $99, but the memory expansion, disk drives, and so on to go with it – which turn it into a far more practical system – may cost you an additional $1,000. And that's before you buy that word processor or data manager software.

In most consumer market items there's far more parity of pricing, given that one rarely expects to pay more for a lens than a camera; more for a record than a player. In the home computer market, especially the low end, this pricing parity expectation is even more greatly exaggerated. There's not very much you can add to your computer that doesn't cost more than the computer did.

We suggest that this simple mismatch may have a great deal to do with perceptions of machines such as the Timex/Sinclair which has recently been falling off in sales. And these aren't sales that are necessarily being lost to other market leaders. The industry is simply not expanding at the rate many expected.

Perhaps bundling (selling a combination of home computer, peripherals, and software) will provide an answer. We'll be closely watching the success of Adam, and an expected bundled Commodore 64 package, to see what the market decides.

Random Bits: Where is *Baby Blue*? As all the industry speculates on the arrival of the IBM Home Computer (frequently called Peanut), other industry stocks are being buffeted by the rumors and speculation about this long-pending announcement. One important point to remember is that there are literally thousands of computers being sold each day, and the market is truly growing.

Commodore 1541 disk drives are in short supply, and a rumor exists for every possible reason. While some have suggested that a recall has quietly taken place, it appears to us that the shortage that Commodore predicted several months ago is actually upon us. This shortage has been complicated by an apparent high rate of problems with the drives, causing excessive downtime and consumer complaints.

Robert Lock

Editor In Chief

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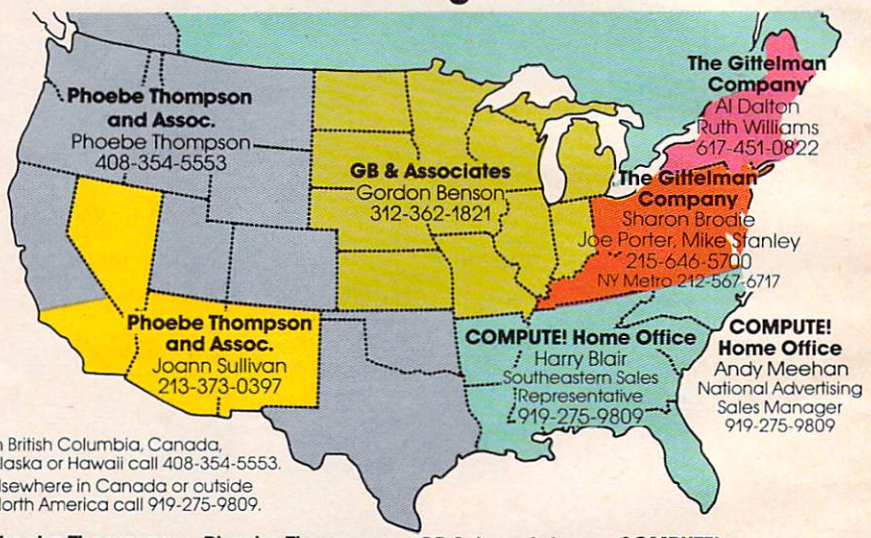

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The Editors and Readers of COMPUTE!

Tone Generator For The VIC

I own a VIC-20 and I am very pleased with it. However, I would like to know if it's possible to add a tone generator so that when I hit a key on the keyboard a tone is heard to indicate that an entry was made. I've seen this on other computers and find it most useful.

Kevin M. Regenhard

The positive stroke keyboard tone generator you mention is not built into the VIC-20. However, it is possible to program this useful function into your VIC.

Type in, SAVE, and then RUN the following short BASIC loader which will POKE in a machine language program. The program is written to run in the cassette buffer, so it shouldn't interfere with your BASIC programming memory. Once the program is POKEd into memory, SYS828 to start, and press RUN/STOP – RESTORE to stop.

```
60000 FOR A=828 TO 861: READ B: POKE A,B:
      NEXT: END
60010 DATA169,15,141,14,144,120,169,78,14
      1,20,3,169,3,141,21,3,88,96
60015 DATA165,197,201,128,240
60020 DATA7,101,197,105,128,141,12,144,76
      ,191,234
```

The Atari Mystery Connection

I took apart the Atari 400 and noticed on the back of the main board chip that there is a connection not in use. What is this connection for and why is it not in use?

Ki Jeong Yun

This connection, also found on the Atari 800, is used by Atari to test the machines on the assembly line. Due to its inaccessibility, it has never had any other use, although it could possibly be used for expansion.

Double-spaced Listings On Commodore Printers

I have a Commodore 64 and a Commodore 1525E printer. There are many occasions while I'm debugging a new program when a double-spaced paper listing would provide a lot more room to make corrections and additions.

Is there a way to force the LIST command to double-space on the printer without modifying the program being listed? Perhaps Jim Butterfield could suggest a short machine language routine.

Stephen D. Eitelman

Yes, it is possible to command the printer to double-space during the LIST command. In fact, all Commodore printers and many other printers have this ability. You will also, of course, see double-spaced listings on your screen. With any Commodore printer, you can enter and run one of these short BASIC programs, which will POKE a machine language program into the cassette buffer to create double-spacing.

```
5 AD = PEEK(55)+PEEK(56)*256-20
10 I=AD
15 POKE 55,AD AND 255 : POKE 56,AD/256
20 READ A:IF A=256 THEN END
25 IF A=-1THENA=(AD+11)AND255
26 IF A=-2THENA=(AD+11)/256
30 POKE I,A:I=I+1:GOTO 20
35 PRINT"{CLR}RUN WITH : {RED}SYS"AD
40 CLR
828 DATA 169,-1,141,38,3
834 DATA 169,-2,141,39,3
840 DATA 96,201,13,208,5
846 DATA 32,122,242,169,13
852 DATA 76,122,242,256

5 PRINT"{CLR}RUN WITH SYS 679"
10 I=679
20 READ A:IF A=256 THEN END
30 POKE I,A:I=I+1:GOTO 20
679 DATA 169,178,141,38,3,169,2
687 DATA 141,39,3,96,201,13,208
695 DATA 5,32,202,241,169,13,76
703 DATA 202,241,256
```

TI Free Memory Techniques

I would like to clarify and expand upon the ideas expressed by Howard Patlik in "More on TI Memory" (Readers' Feedback, August 1983). This two-line program for determining free memory on the TI-99/4A was offered:

```
1 A=A+8
2 GOSUB 1
```

If you RUN this program alone and PRINT the variable A, you will find the amount of available memory less the 37 bytes required by the program itself. (A equals 14536, so A plus 37 equals 14573 bytes of memory for programming.) When the program RUNs, the GOSUB in line 2 will ex-

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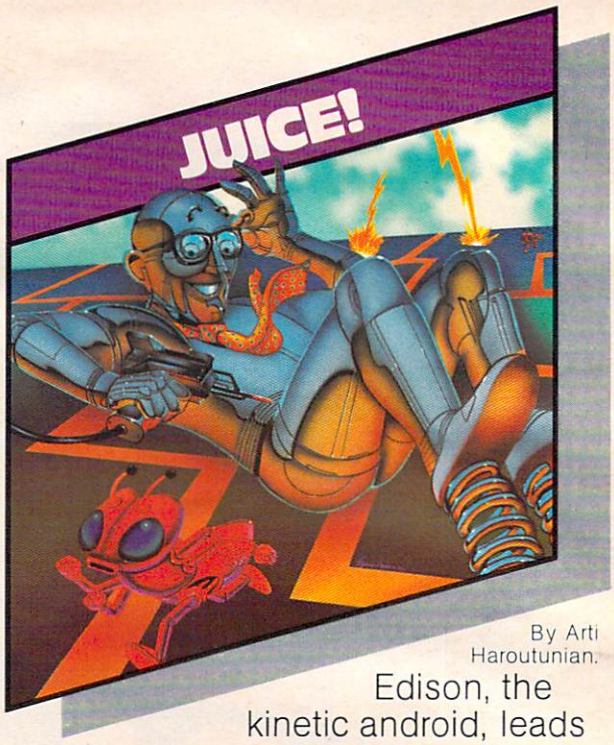

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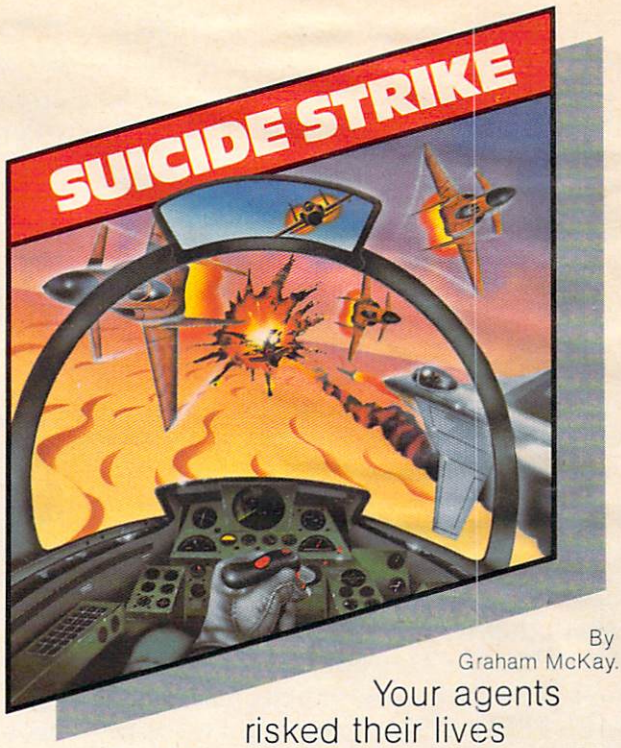

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ecute 1817 times before a MEMORY FULL error is issued in line 1. Each time this GOSUB executes, 8 bytes of memory are consumed and thus 1817 times 8 is 14536. As many as 7 bytes may still be unused.

Of course, if this two-line routine is entered with a program already in memory (providing the variable A is not used within this program), you will find the amount of free memory less 37 bytes when you RUN and PRINT A.

There are some more considerations. String variables and graphic characters defined above CHR$(127) will require additional memory that this two-line routine will not pick up. The TI-99/4 has 256 more free bytes than the TI-99/4A, but if graphic characters above 127 are used, then both will use the same amount of memory.

Screen and BASIC overhead is 1792 bytes. And if all or only the graphics character 159 is used, then overhead is 2048 bytes (1792 + 8*(159-127)). The 16K TI-99/4A is, of course, actually 16,384 bytes. So, 16,384 minus 1792 is 14,592 bytes free. (There is a slight discrepancy from the two-line method of up to 19 bytes.)

Here is another way to find memory size using CALL PEEK. For TI BASIC, you need the Mini Memory or the Editor/Assembler cartridges. Type in CALL PEEK(-31974,A,B). Again the variables A and B should not be in the program. Then PRINT A*256 + B-1776. With no program present, this will give a size of 14577 bytes free.

To check this with TI Extended BASIC (Version 110), type PRINT A*256 + B-2455. The TI's response is 13886. Now type SIZE. The TI responds with 13886 BYTES FREE.

Another user of memory in TI BASIC is Terminal Emulator II. It takes about 512 bytes. It is also well-known that the disk controller uses console memory. Even after ENTERing CALL FILES(1) and the NEW command, it still uses 1052 bytes. Here's how to free up this memory. Type CALL LOAD(-31888,63,255) and NEW.

Again, in TI BASIC the Mini Memory or Editor/Assembler cartridge is needed, but in TI Extended BASIC, the 32K Expansion is needed. To restore disk drive(s) and disk controller, use the command BYE or FCTN QUIT.

Paul E. Schippnick

Atari Upgrade Update

We have recently heard from several factory authorized Atari service center representatives who tell us that there is an inexpensive (under $30) upgrade for the 10K ROM operating system. The original operating system of the 400/800 had a number of minor errors (bugs), and the Revision B operating system corrected these problems. This is the first time to our knowledge that Atari has offered this upgrade. To check which operating system you have, enter: PRINT PEEK(58383). If you get a 56, you may want to visit your nearest service center and get the upgrade (a value of 0 returned means you already have Revision B).

Another Perfect Commodore INPUT

In the last several issues I have seen a number of "Perfect INPUTS" to avoid Commodore's return to READY from input. All of these methods work. In my opinion, however, since you can continue from READY by entering CONT on a clear line, their disadvantages outweigh their advantages.

I have another way of avoiding this problem. It uses the standard INPUT statement and CBM's active screen. When an input statement is executed, CBM BASIC prints a ? at the current cursor position, then moves the cursor to the right one additional space. All of the positions to the right of the cursor are automatically allocated for inputting data (up to 80 characters). By printing some default value into this area before executing the input statement, not only do you avoid the return to READY, but you also allow for inputting default values by just hitting RETURN.

For example:

```
10 VA = 10 : REM SET DEFAULT VALUE TO 0
20 PRINT "WHAT IS THE NEW VALUE": PRINT
   " "; VA;"{UP}"
30 INPUT VA
40 PRINT "THE CURRENT VALUE IS"; VA
50 INPUT "IS THE VALUE CORRECT (Y/N)
   {3 SPACES}Y{3 LEFT}"; A$
60 PRINT "WHAT IS THE VALUE"; TAB(20);"D
   EFAULT VALUE"
70 PRINT TAB(18);"{UP}";
80 INPUT DV$
```

This appears on the screen as:

```
WHAT IS THE NEW VALUE
? 10
THE CURRENT VALUE IS 10
IS THE VALUE CORRECT [Y/N] ? Y
WHAT IS THE VALUE ? DEFAULT VALUE
```

The flashing cursor is positioned over the 1, Y, and D respectively.

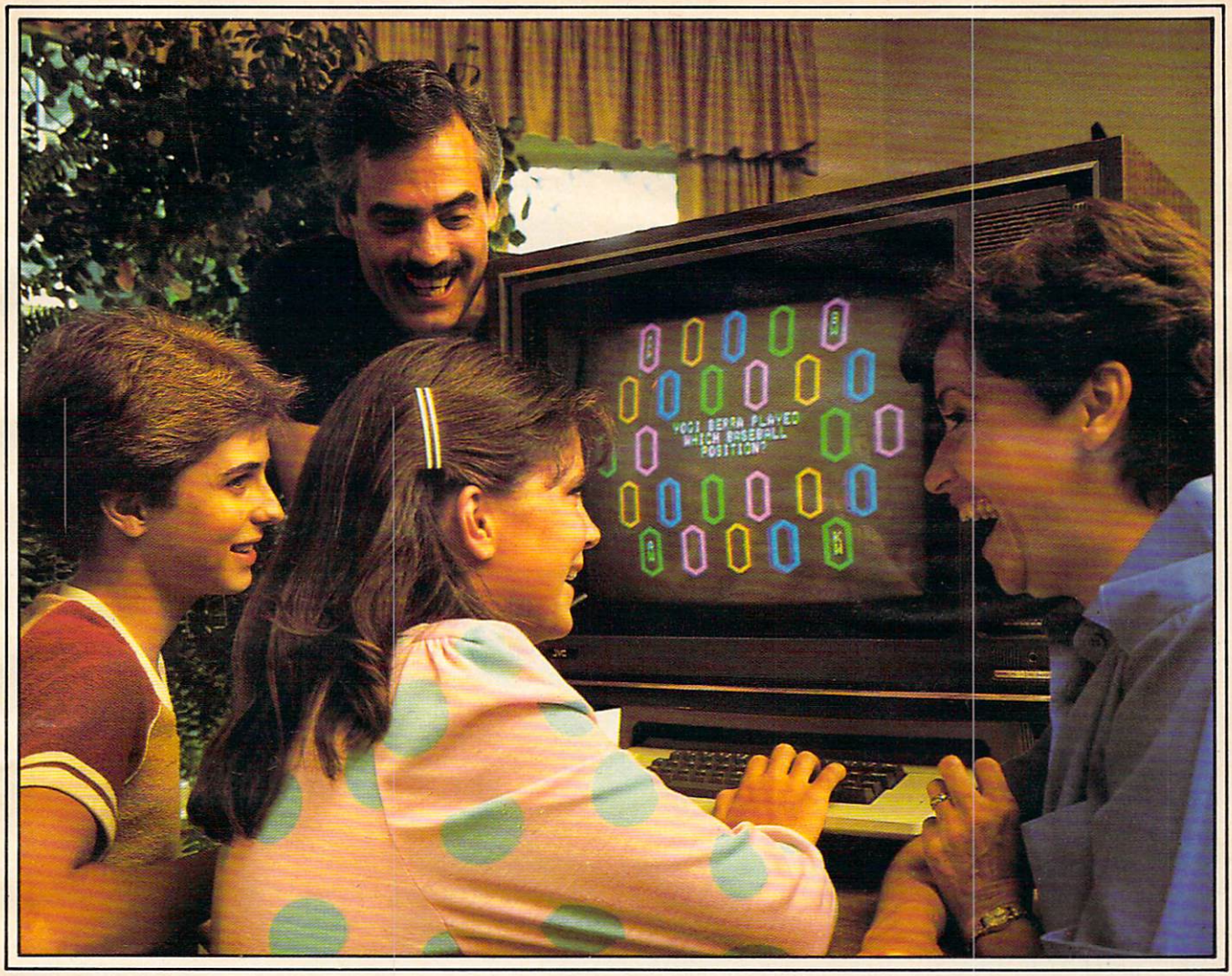
By hitting only the RETURN key (3 times), you INPUT 10 to VA, Y to A$, and DEFAULT VALUE to DV$. If you want some other value, you need only type it in before hitting RETURN.

By taking a little time in choosing default values when writing a program, you can save a lot of time when running it and entering data.

Dennis D. Duke

Atari Listings

How can hard copy be printed from RAM memory which has been loaded from a user-made BASIC program on a cassette? I realize that this is not too difficult a problem, but I have not found a solution



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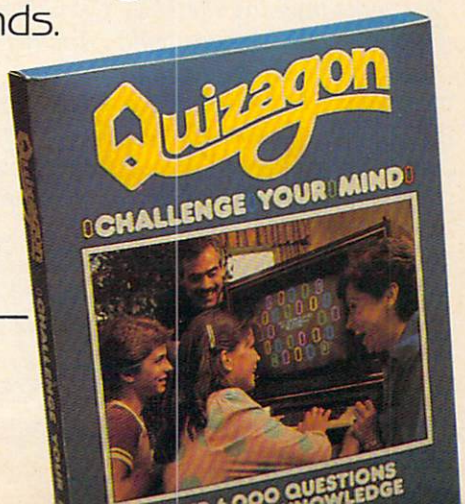

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in either your Atari books or in the issues I have of COMPUTE!.

David Cimochowski

*If we understand your question, you want to print out a listing of a BASIC program in memory. Use the command LIST "P:" for this purpose. You can also use the following program to copy any data file (*not *programs) to your printer.*

```
100 OPEN #1,4,0,"C:":REM Use OPEN #1
    ,4,0,"D:name" for disk
110 OPEN #2,8,0,"P:":REM Output to p
    rinter
120 TRAP 140:REM Go to 140 when end
    of file error occurs
130 GET #1,A:PUT #2,A:GOTO 130
140 PRINT #2:CLOSE #1:CLOSE #2
150 END
```

Mode Shifting And Automatic Tape RUN For Commodore

I seem to remember reading of a POKE that allows the use of upper- and lowercase with the use of the shift key, but can't find it in the *Programmer's Reference Guide*, the *VIC-20 User's Manual*, or *COMPUTE!'s First Book of VIC*. Could you tell me what this POKE is? Also, how do I make my taped programs run after being LOADed without my intervention?

Tim S. Hallen

There are a number of ways that you can place the VIC-20 or the Commodore 64 into the upper/lowercase or "text" mode. Using a POKE, the locations are 36869 on the VIC, and 53272 on the 64. These locations are on the VIC (Video Interface Chip) chip of each machine, and tell the computer where to get its character set. On the VIC, the normal value is 240, and on the 64 it's 21. To place the VIC into the text mode, POKE 36869,242 and for the 64, POKE 53272,23. To return to uppercase/full graphics (normal) mode, POKE 36869,240 on the VIC, and POKE 53272,21 on the 64.

There are other methods which switch between text and normal modes. One of these is to hold down the COMMODORE and SHIFT keys. To switch to text mode, press and continue to hold the COMMODORE key while pressing the SHIFT key. To return to normal, simply toggle the keys again. Another method, and probably the safest and most efficient, is via the PRINT command. To switch to text mode, type PRINT CHR$(14) then press RETURN. To return to normal mode, type PRINT CHR$(142). These PRINT statements can also be used within a program if you wish.

There are a number of ways to make the computer automatically run your programs after LOADing. The easiest is via the keys on the keyboard. After positioning your tape cassette to the beginning of the program you wish to LOAD and RUN, press and continue to hold the SHIFT key, then press the RUN/STOP key. This will LOAD your program into memory, then run it without your having to type and enter RUN.

*Another method is to "string load" your cassette programs. String LOADing programs is LOADing and RUNning one program which in turn LOADs and RUNs the next program on the cassette tape. To accomplish this, LOAD and RUN your first program normally, and use the last statement of this program to call in the second program with a LOAD command. For instance, the last line of the program would read: 60000 LOAD "*filename*". When the program encounters this statement, it will automatically LOAD and RUN the next program on the cassette tape. This can also be a very useful programming technique for saving memory if, for example, you have a program that has a long list of instructions for the user to read before running the program. You can use the first program in the "string" to display the instructions and then load in the second program when the user is finished reading.*

Use Any Tape Recorder With Atari?

I am a new owner of an Atari 800. I eventually plan to purchase a disk drive, but as a temporary storage device, I would like to use my Panasonic cassette recorder, rather than purchase an Atari 410 or 1010 program recorder. Is this possible? If so, how do I go about wiring connections without causing any damage to the computer?

Mark Inman

The serial plug used to connect Atari peripherals has connections for audio out and audio in. You can attach a standard recorder to audio out and record CSAVEs, but there is no way to get the computer to read the audio-in line (which is used to play the audio track through the TV speaker). The Atari 410 recorder has a special analog to digital circuit used to translate tape tones into digital information that the computer can *read.*

Text On The Apple High-Resolution Screen

My family has just purchased an Apple II+ computer. I can program graphics on the high-resolution screen, but things just aren't the same without text somewhere besides the text window at the bottom of the screen. Is it possible to put text on the high-resolution graphics screen?

Mark Hayek

You can put shapes that look like text on the Apple's high-resolution graphics screen by using the program "HRCG" (high-resolution character generator) that comes on the DOS Tool Kit disk. This program can be accessed from a BASIC program and will load shape tables representing different character sets into memory just below DOS.

Normally, these shape tables will produce the standard ASCII characters on the high-resolution screen. However, there are other character sets on the Tool Kit

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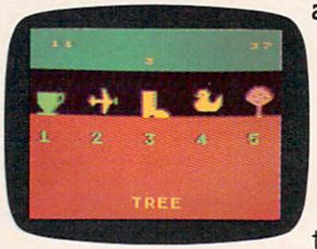

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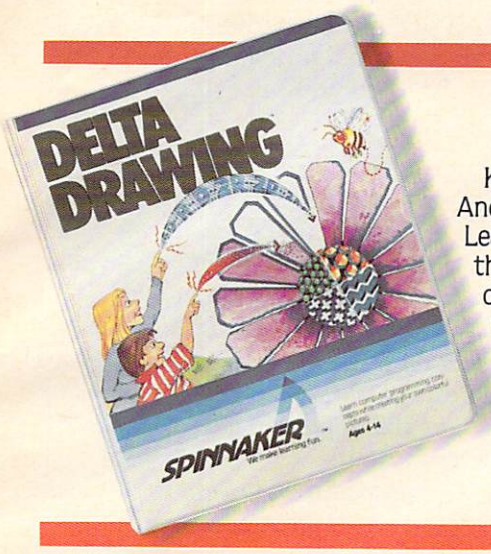

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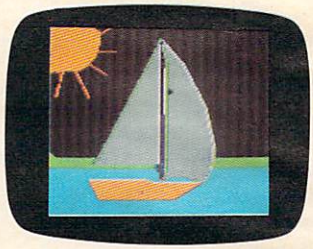

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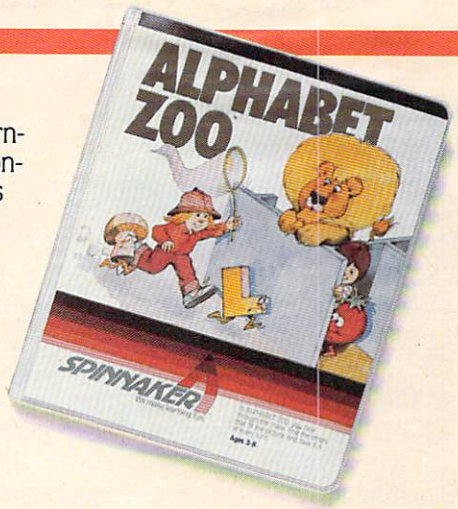

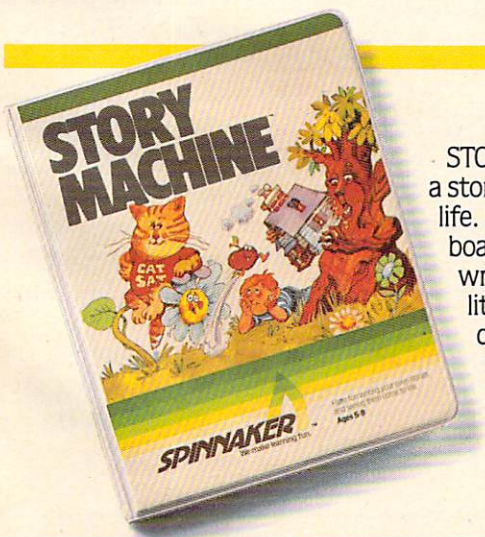

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disk which can be substituted for the ASCII set. If you like, you can even define your own character set using the program "Animatrix," also on this disk. This method was employed in the Apple version of the game "Goblin," which appeared in the July 1983 issue of COMPUTE!. Consult the booklet which accompanies the Tool Kit disk for details on these techniques.

Programming The Commodore Joystick

I own a Commodore VIC-20. I have learned how to program games, but I have not learned how to program the games to respond to a joystick.

I have looked in the *VIC-20 Programmer's Reference Guide*, but I did not understand the information. I would like to know how to program games to respond to a joystick. Would you please explain this to me?

Mitchell Kerman

In both the VIC-20 and the Commodore 64, the joystick is programmed by PEEKing two bytes.

The VIC is designed to handle only one joystick, and it takes two bytes to control that joystick. In the VIC, location 37137 is PEEKed to read the joystick for the up, down, left, and fire button movements. Location 37152 is PEEKed to detect movements to the right.

The 64 is designed to handle two joysticks, and unlike the VIC, each joystick is controlled with one byte. To detect the position of a joystick plugged into port A, PEEK 56320, and for port B, PEEK 56321 is used.

To see just how easy it is to detect movement on the joystick, plug in your joystick, type in one of the following short programs, and then RUN. The programs simply PEEK the joystick control bytes, and then PRINT that reading to the screen.

For the VIC-20:

```
10 PRINT PEEK(37137),PEEK(37152): GOTO 10
```

For the Commodore 64:

```
10 PRINT PEEK(56320),PEEK(56321): GOTO 10
```

As you run the programs and play with the joystick, you'll see the values printed to the screen change as the values in the joystick ports change. You can program the joystick into your games by PEEKing these locations, and using IF...THEN statements in your program to process the information.

A quick word about programming techniques here. Because the joystick control bytes are often shared (that is, they do other things besides read the joysticks), it is more efficient to PEEK only the affected bits *in the joystick control bytes. This will filter out other information not connected to the joystick. This is done by ANDing your PEEKs. For more information on which bit is used for each joystick application, consult the* Programmer's Refeference Guide *for your specific computer.*

Saving Machine Language Programs

I'd like to protect programs I write on my VIC-20, and I know that using machine language accomplishes this. But how do you save machine language on tape?

Dave Karlson

The easiest, quickest, and most efficient way to save a machine language program is from within a machine language monitor. There are many monitor/assembler packages available for your VIC-20, among them "TINYMON1," published in COMPUTE!'s First Book Of VIC, *and the VICMON Machine Language Monitor Cartridge available at your local Commodore dealer. The following technique will also work successfully on the Commodore 64.*

*Once a monitor is loaded and running, the usual format for saving to cassette tape is: S "*name*", XXXX, YYYY, 01 where S = save,* name *= name of program, XXXX = starting address of the machine language program to be saved, YYYY = ending address of the program, and 01 is the device number (tape). Saving to disk would use the same format, except that the device number would be 08 (disk). However, it should be noted that some monitor/assemblers use a different format. See the accompanying documentation.*

There is another way to save machine language programs, but it involves some redefining of the VIC's operating system. You can save a machine language program in the same manner that you would a BASIC program. To accomplish this, you have to redefine, or POKE three sets of pointers. First, you have to determine the beginning and the ending addresses of the machine language program. Once this is known, POKE 43 and 44 (start of BASIC pointer) to point to the beginning of the program, POKE 45 and 46 (start of BASIC variables, or end of BASIC pointer) to point about 10 bytes past the end of the program, and POKE 55 and 56 (highest address used by BASIC) to point about 30 bytes past the end of the program. Next type CLR. Now you are ready to save to tape or disk in the normal manner, i.e., "SAVE filename*, 1" (for tape) or "SAVE* filename*, 8" (disk).*

To LOAD the programs back into memory, use the standard format for LOADing machine language programs: LOAD filename, device number, *1. For example, LOAD "filename", 8, 1.*

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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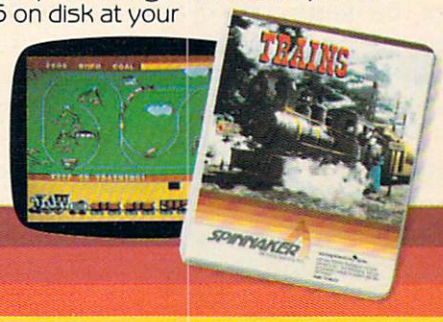

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Questions Beginners Ask

Tom R. Halfhill, Features Editor

Are you thinking about buying a computer for the first time, but don't know anything about computers? Or maybe you just purchased a computer and are still a bit baffled. Each month, COMPUTE! will tackle the questions most often asked by beginners.

Q I have recently purchased a computer with a cassette recorder. In a recent issue of COMPUTE!, an author stated, "Remember that the safest way to make sure that your program is not lost forever is to save it at least every half an hour that you work on it." Does this mean that, when typing in the extra long programs, you should stop half an hour into the program and save it, then continue typing from that point on?

A To be safe, yes. You might want to stop and save the program even more often, or less often – depending upon how much of your work you are willing to reconstruct in the event of a disaster.

Remember that programs loaded from disk or tape, or typed on the keyboard, are kept by the computer in Random Access Memory (RAM). RAM holds this information only while the computer's power is on. If you are typing in a long program and a thunderstorm suddenly knocks out the electricity, or if someone kicks loose the power cord, all your work will be lost. You would have to start over again from the beginning.

That's why most people "safety save" the program they are typing or writing. Admittedly, if you are working with a cassette recorder instead of a disk drive, this can be inconvenient because of the waiting involved. A very long program might take ten minutes to save. If you save your work every half-hour, you could spend one-third of your time waiting for the recorder.

A good compromise might be to save to tape once every hour. Decide for yourself: If there are no storms brewing, if the power cords are safely hidden from passing feet and pets, and if no one else is around to accidentally turn off your computer, you can probably get away with saving your work less often than someone who must put up with such hazards.

Q I own an Atari 800 (48K) with a 410 Program Recorder and my brother owns an Atari 400 (16K) and a 410 also. Is there any way to interface the two computers in order to play a program through both at the same time?

A It is possible to hook up two (or more) computers to share a program – even two computers which are normally incompatible – but there are several complications involved.

First, you would have to buy or make a cable to hook the two computers together. One way would be to use the parallel or serial ports on a pair of 850 Interface Modules, or the built-in serial bus on each computer (although the latter method would interfere with access to peripherals, such as your cassette recorders). I know of no cables for this purpose, and making one would be a task for a knowledgeable technician.

Perhaps using a pair of modems would be the easiest way to hook up the computers. Each computer would require its own modem and telephone. You would call up your brother's computer and link them together over the phone lines. Of course, this would also require the proper terminal software – a program to allow each computer to act as a remote terminal, communicating with the other. Whatever you typed on your computer would appear on your brother's screen, and vice versa. In effect, you would be "sharing" a program on both computers – the terminal program.

But to do anything more would require a special program to take the place of the terminal software. You don't mention in your letter what type of program you want to share on both computers. There are only a few programs designed for this. If you want to play an interactive game – with you and your brother making moves and countermoves from your own computers – you'd need a game program specially designed for this. The only one I've heard of is *Commbat* by Adventure International. This is an interactive tank battle game with simple graphics that can be played over the phone lines between even normally incompatible computers, such as a Radio Shack TRS-80 and an Atari.

Be aware, however, that such games are limited by the speed of data transmission over the phone lines. It is very difficult to program fast action and flashy graphics. For more information, see "Telegames: Computer Games By Phone," in last month's COMPUTE!, and "Telecommunications: How To Get Started," elsewhere in this issue.

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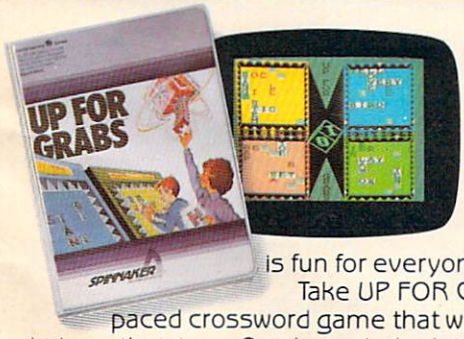

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TELECOMMUNICATIONS: How To Get Started

Kathy Yakal, Editorial Assistant

More and more people are using their personal computers to communicate with bulletin board systems, information services, mainframe computers, and other personal computers. How do you get started in telecommunications? What kind of software do you need? Here's an overview.

Telecommunications has been big news lately. People are breaking into university systems and bank account files. They're even doing what some people said couldn't be done after *WarGames* came out: making some sort of contact with computers that monitor and control this country's defense system.

Anchor Automation's Volksmodem *can interface with most personal computers via a separate cable. It is a* direct-connect *modem.*

Translating Foreign Signals

In telecommunications, the information being sent from one computer to another travels over the telephone lines. Though this is the most efficient method available now, there is a problem: telephones and computers are based on different technologies. Phone systems are designed to filter out the very clicks and pops that computers use to communicate.

This is why you need a modem (MOdulator/DEModulator). This device modulates the computer's digital signals into analog signals, so the phone lines can carry them, and then demodulates them back into digital,

Now from Timex...a powerful new computer.

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Far beyond anything you've ever experienced before in video games.

Unique graphics, crisp detail and brilliant sound all come together with spectacular impact.

River Raid,™ the battle adventure up the "River of No Return."

The realism of Carol Shaw's River Raid is utterly amazing.

It challenges your reflexes, stamina and strategic savvy as you battle your way up the winding river.

Enemy choppers. Jets. Tanks. Hot-air balloons. Ships. All out to blow you to smithereens.

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Bridges. Mountains. Canyon walls. Islands.

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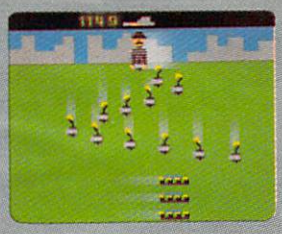
Everything that made River Raid such a smashing hit is here. And tons more.

Kaboom!®, the award-winning game of catch with buckets and bombs.



Larry Kaplan's Mad Bomber is back. The buckets are back.

But now, in Paul Willson's adaptation, you can drop the bombs, while someone else tries to catch them.

Imagine dropping bombs. Faster and faster.

To the ever-quickening pace of the 1812 Overture.

You shift right. Left. Back again. All the way right.

He misses! You win!

Now it's your turn to catch. The pressure mounts.

The bombs start flying. You dash to catch them.

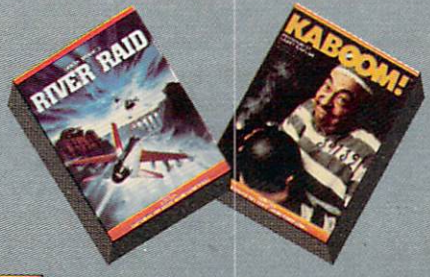
And so it goes on into the night.

And everytime you hit a new high score, it's displayed after the game, just like at the arcade.

Kaboom! and River Raid for your Atari home computer.

They're here.

Just for the fun of it.



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so the computer on the other end can receive them. The modem serves as a translator.

There are two types of modems commonly used with personal computers. *Acoustic modems* have a set of soft rubber cups into which you insert the phone's handset. One cup contains a speaker, which generates audio tones, the other a microphone, which receives tones from the other modem.

Once you have the correct hardware and software for telecommunications, there is a great deal of information that you can access.

Direct-connect modems plug directly into the telephone through a modular phone jack. Some, like the VICmodem, are cartridges that are plugged directly into a port on the computer. Others are stand-alone units about the size and shape of an eight-track cartridge tape which can be placed directly beneath the phone and plugged in. Some of these have a feature which allows you to switch from phone functions to modem functions. This spares you from having to keep connecting and disconnecting the modem when you want to use the phone to make a call.

Acoustic modems are generally less expensive but direct-connect modems generally offer a better connection, since the sound frequencies necessary for telecommunications are generated directly on the phone lines. Extraneous room noises can interfere when you're using an acoustic modem if the phone handset is not sealed very tightly in the cups.

Some computers come with a built-in modem. The Radio Shack TRS-80 Model 100 Portable Computer is an example. The modem functions and terminal software are contained inside the computer; all you need is a cable to start telecomputing.

Dumb Peripherals

If you turn your personal computer into a terminal when using a modem, how can it accomplish something as complicated as transmitting data to another terminal around the block or around the world? Your computer must be able to send and interpret bits in the pattern you want, or you'll just be sending and receiving nonsense. This is why you need special software for telecommunications.

Some terminal software comes on cassette, some on disk, and some in cartridge form. There are several terminal programs in this issue.

Matching Up

Also, a modem must be properly aligned with another modem before information transmission is possible. Both modems must be matched in several ways.

Baud rate is the number of bits being sent every second. This can vary from 110, which is what the old teletypes use, up to 9600. The faster the rate, the lower your phone bills. But sending information as fast as 9600 bits per second really tests the capabilities of the telephone system. In order to establish communications, you need to know the baud rate at which the system you are calling is operating so that you can set your terminal software to the same rate.

Another factor is *duplexing*. Full-duplex means being able to send and receive data at the same time. Half-duplex allows for only one-way communication. If this is not matched correctly to the system with which you are communicating, you may see double characters on your screen or none at all.

Some terminal software allows you to *upload* and *download* programs. Say you have a friend in another part of the country who just programmed

The Racal-Vadic VA3413 *is an* acoustic *modem. The telephone handset is pushed into the soft rubber cups on the side.*

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Consumer Information Service, P. O. Box 20212
5000 Arlington Centre Blvd., Columbus, OH 43220

800-848-8199

In Ohio call 614-457-0802.

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Modem Manufacturers And Distributors

Listed below are the manufacturers and distributors of the modems included in our buyer's guide, as well as those of the major information and news services.

Anchor Automation
6913 Valjean Street
Van Nuys, CA 91406

Cermetek Microelectronics, Inc.
1308 Borregas Avenue
P.O. Box 3565
Sunnyvale, CA 94089

Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380

Emtrol Systems, Inc.
123 Locust Street
Lancaster, PA 17602

Hayes Microcomputer Products, Inc.
5923 Peachtree Industrial Boulevard
Norcross, GA 30092

Microbits Peripheral Products, Inc.
225 West 3rd Street
Albany, OR 97321

The Microperipheral Corporation
2565 152nd Avenue N.E.
Redmond, WA 98052

Novation, Inc.
20409 Prairie Street
Chatsworth, CA 91311

Prentice Corporation
266 Caspian Drive
P.O. Box 3544
Sunnyvale, CA 94088

Racal-Vadic
1525 McCarthy Boulevard
Milpitas, CA 95035

TNW Corporation
3444 Hancock Street
San Diego, CA 92110

Universal Data Systems
5000 Bradford Drive
Huntsville, AL 35805

a great game and wants to share it with you, but doesn't have a printer. If you both have the same kind of computer, and an appropriate terminal program, that program can be uploaded (sent) to you. What you will be downloading is ASCII code (numbers which represent all possible screen characters). Each character is received one at a time. Not all terminal software has this capability; make sure that yours does if you want to be able to upload and download to and from bulletin board systems, information services, or other personal computers.

The World Of Telecomputing

Once you have the correct hardware and software for telecommunications, there is a great deal of information that you can access:

News and information services. CompuServe and The Source are two examples. Once you have purchased a subscription, you can call, type in your secret ID number or password, and have all kinds of information delivered to you immediately – news, sports, stock market reports. You can set up your own *electronic mailbox* so that messages can be left for you. CompuServe even has its own version of CB radio: You can get on-line with other people using the system and have a conversation.

Bulletin board systems. Offering some of the features of the major information services, there are hundreds of bulletin board systems set up in North America. Some of them are free, some require a membership fee. Most of them are designed to bring together people with common interests: owners of specific types of computers who want to share programs and help solve

News And Information Services

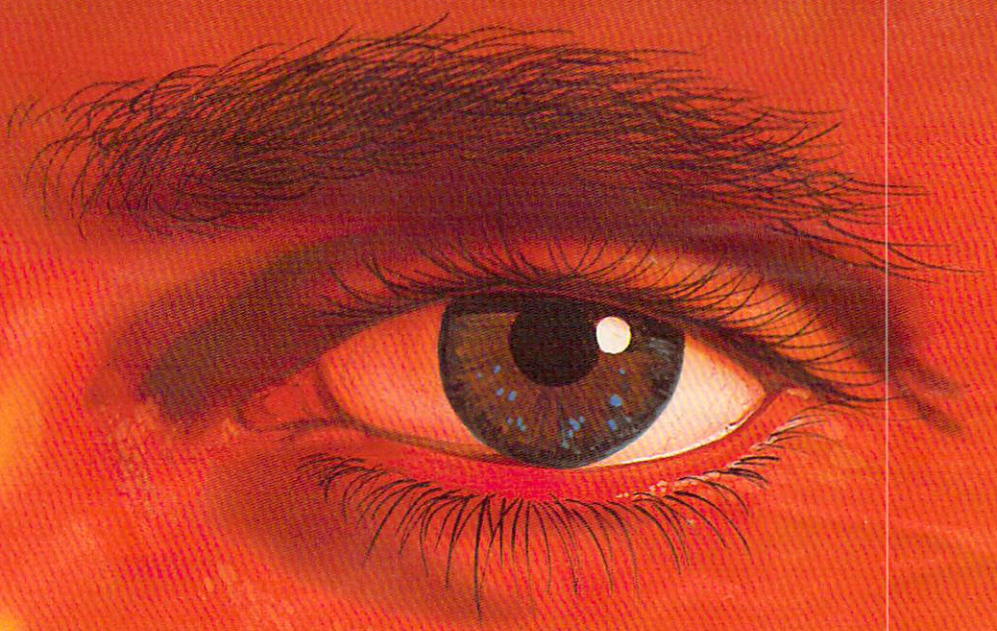
Here are addresses and phone numbers for some of the major news and information services. New York Zoetrope publishes *The Directory of On-Line Databases;* you can get one by sending $29.95 plus $1.50 for shipping and handling to New York Zoetrope, 80 East 11th Street, New York, NY 10003.

CompuServe
5000 Arlington Centre Boulevard
P.O. Box 20212
Columbus, OH 43220
Customer Service: (800) 848-8990
or (614) 457-8650

Dow Jones Information Services
P.O. Box 300
Princeton, NJ 08540
Customer Service: (800) 257-5114
or (609) 452-1511

The Source
1616 Anderson Road
McLean, VA 22102
Customer Service: (800) 336-3366
or (703) 734-7500

Telenet
(GTE Communications)
8229 Boone Boulevard
Vienna, VA 22180
Customer Service: (800) 572-0408 (in Virginia)
(800) 336-0437 (outside of Virginia)
(703) 442-2200 (outside of U.S.)



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@ 39.95 ea. Plus ☐Interface Device at $89.95 ea. Add $3 shipping & handling. Michigan residents add 4% sales tax. TOTAL PRICE $_____. Enclosed is check or money order. Computer Type: ☐VIC-20 ☐Comm. 64 ☐Atari 400, 800. Specify ☐Cart. ☐Disk ☐Tape. I will use with cable, transmitting on Ch. ☐2 ☐3 ☐4 ☐Other. Send ☐Dealer info. ☐FREE brochure. ☐Enclosed is $3 for System Manual only.

Dealer inquiries, orders call 517-332-7717.

NOTE TO BUYERS: Owners of VIC 20® and Commodore 64® Computers can view Expando-Vision ™ with TV signals from a TV antenna (Ch. 3 or 4 only), cable TV (transmissions on Ch. 3 or 4), or from any video cassette or video disk player. Atari 400 or 800 owners can use Expando-Vision with TV antenna (Ch. 2 or 3 only), Cable (transmissions on Ch. 2 or 3) or any video cassette or disk player. Systems compatible with other home computers are under development and will be introduced soon.

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Straight To The Mind's Eye

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hardware or software problems, people involved in ham radio, film buffs – even people who want to find a date.

Personal business. It may be possible soon to attend to most of your personal needs with your personal computer. Periphonics, an Exxon affiliate, has developed an interface that permits a bank to link up with almost any personal computer for individual bank transactions. Shopping by mail is possible through the Burbank-based "Fantasy Plaza." Expect to see more services like this springing up.

Computer programs over the radio. It is possible to download computer programs from your radio. The Microperipheral Corporation has even developed a modem designed for reception of computer data from commercial radio stations. Though this is not a widespread use right now, radio stations and cable operations around the country may soon be following the lead of stations like KMPS in Seattle, which has been downloading computer programs by radio since March.

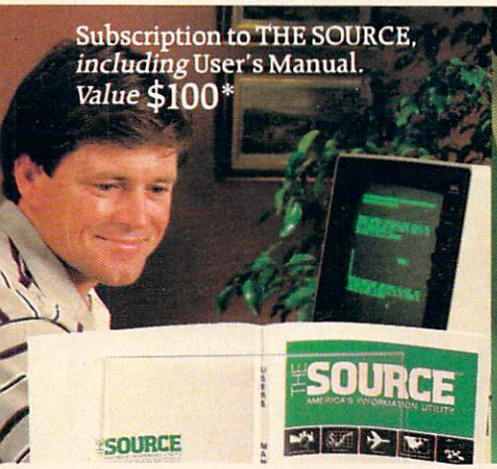
A Buyer's Guide To Modems

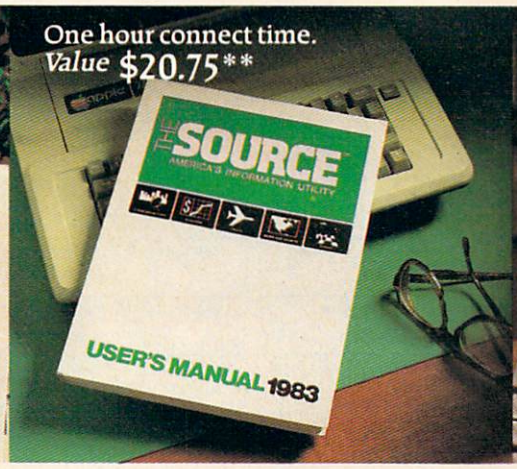
The following chart lists features of several modems compatible with personal computers. We have tried to include as many as possible; any omissions do not represent an editorial judgment on their quality. If you need more information about a specific modem, consult the list of manufacturers and distributors.

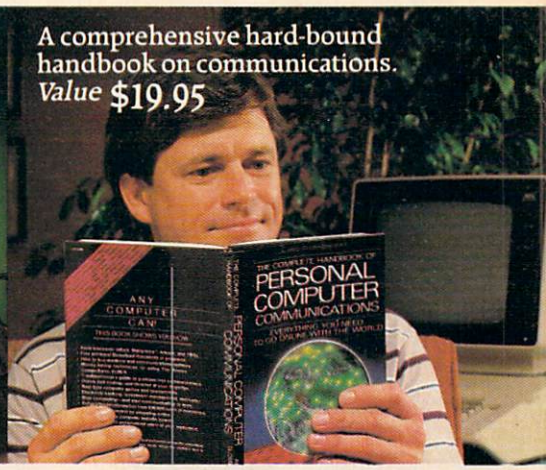
Here is a brief explanation of the categories on the chart:

- *Compatibility.* This is probably the most important consideration in choosing a modem. Since modems are serial devices, most are RS-232 compatible; some, however, are specific to certain machines. Even if your computer has an RS-232 port, make sure you have the necessary interface cable.
- *Communication Standard.* The Bell 103 is the most common communication standard found on modems available for personal computers. It allows information to be sent at the rate of 300 baud; some can go as fast as 600 baud. The Bell 202 and 212A facilitate data transmission at a faster rate.
- *Coupling Method.* A modem can link your home computer to the phone lines in one of two ways. A direct-connect modem plugs directly into the phone through a modular phone jack. Acoustic modems require a standard desk phone handset, so that the handset can be pushed directly into the modem's soft rubber cups.
- *Baud Rate.* Or, more technically correct, bits per second. A speed of 300 baud is pretty standard on most of the modems you will encounter.
- *Duplexing.* Half-duplex and full-duplex indicate whether information can be sent and received at the same time. When telecomputing, failure to match your modem's duplexing abilities with those of the modem at the other end may result in character duplication or "echo."
- *Auto-Answer.* This feature is necessary if you want to be able to automatically answer calls from other telecomputing stations (for example, if you want to set up a bulletin board system for others to call).
- *Auto-Originate.* Lets your modem dial phone numbers to call other telecommunications facilities.
- *Self-Test.* Some modems have the capability to test themselves to see if everything is hooked up correctly and working.
- *Carrier Detection Indicator.* How can you tell if you have connected with the party at the other end? Most modems have a way of indicating this to you, either by a light or LED on the modem itself, or by a signal that appears on the screen.
- *Power Supply.* Your modem must operate from some kind of power source. Usually this is through a wall socket or internal battery; sometimes the modem draws its power directly from the host computer.
- *Cables/Connectors Included?* Connecting your modem to your computer may require the purchase of additional cables or connectors like an RS-232 cable (if you do not already own one), or some other kind of system-specific connector. Some, like the VICmodem, plug directly into the computer.
- *Terminal Software Included?* Some modem packages include terminal software. If the one you buy does not, you will need to either purchase a program or type one in from a magazine or book.
- *Price.* The modems listed on this chart include suggested retail prices at the time of this writing.

Buy Micromodem IIe™ with Smartcom I™ software *right now,* and get this $140 value FREE!







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4. That's all it takes! Look for your User's Manual and free communications book within two weeks of receipt of the agreement, sales receipt and registration card.

†THE SOURCE requires a major credit card for billing of hourly connect time to individual members. Corporate members may apply for direct billing.

*Suggested retail price. **60 minutes or more connect time, depending on the day and hour.

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MODEM	Volksmodem	Mark VI	Mark VII	Mark X	Mark XII	AutoVIC 1650	VICmodem	Info-Mate ZIZA	TRS-80 Lynx
Manufacturer/ Distributor	Anchor Automation	Anchor Automation	Anchor Automation	Anchor Automation	Anchor Automation	Commodore Business Machines	Commodore Business Machines	Cermetek Micro-Electronics, Inc.	Emtrol Systems, Inc.
Compatibility	most personal computers	IBM-PC	RS-232	Hayes-compatible	Hayes-compatible	Commodore 64	VIC-20 and Commodore 64	RS-232	TRS-80 I, III
Communication Standard	Bell 103	Bell 103	Bell 103	Bell 103	Bell 212A	Bell 103	Bell 103	Bell 212A	Bell 103
Coupling Method	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect
Baud Rate	300	300	300	300	300-1200	0-300	0-300	300/1200	300
Duplexing	full/half	full/half	full/half	full/half	full/half	full/half	full	full	full/half
Auto-Answer	no	yes	yes	yes	yes	yes	no	yes	yes
Auto-Originate	yes	yes	yes	yes	yes	yes	no	yes	yes
Self-Test	yes	no	no	no	no	no	no	yes	no
Carrier Detection Indicator	varies	tone	light	light	varies	LED	LED	light	LED
Power Supply	9-volt battery	host computer	AC	12-volt adapter	12-volt adapter	host computer	host computer	AC	AC
Necessary Cables/ Connectors Included?	no	plugs into computer	yes	yes	yes	plugs into computer	plugs into computer	yes	yes
Terminal Software Included?	no	yes	no	no	no	no	yes	no	yes
Warranty	lifetime	2 years	2 years	2 years	2 years	90 days	90 days	1 year	1 year
Price	$79.95 ($12.95 for cable)	$239	$159.95	$179.95	$399	$179.95	$109.95	$595.00	$299.95

MODEM	Apple Lynx	Hayes Micro-modem 100	Micromodem II	Stack Smartmodem 300	Smartmodem 1200	Smartmodem 1200B	MPP-1000C	Micro-connection 01	Micro-connection R1
Manufacturer/ Distributor	Emtrol Systems, Inc.	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.	Hayes Microcomputer Products, Inc.	Microbits	The Micro-peripheral Corp.	The Micro-peripheral Corp.
Compatibility	Apple I, II, II+	S-100 bus	Apple	RS-232	RS-232	IBM-PC	Atari (no 850 needed)	Osborne	RS-232
Communication Standard	Bell 103	Bell 103	Bell 103	Bell 103	Bell 103 & 212A	Bell 212A	Bell 103	Bell 103	Bell 103
Coupling Method	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect
Baud Rate	300	45-300	110 or 300	0-300	0-300 & 1200	0-300 & 1200	300	300	300
Duplexing	full/half	full	full	full/half	full/half	full/half	full/half	full/half	full/half
Auto-Answer	yes	yes	yes	yes	yes	yes	yes	no	no
Auto-Originate	yes	yes	yes	yes	yes	yes	yes	no	no
Self-Test	no	no	no	yes	yes	yes	no	no	no
Carrier Detection Indicator	LED	none	LED on board	LED	LED	on screen	tone	LED	LED
Power Supply	AC	host computer	host computer	AC	AC	AC	AC	AC	AC
Necessary Cables/ Connectors Included?	yes	yes	yes	no	no	no	yes	yes	yes
Terminal Software Included?	yes	no	yes	no	no	yes	yes	no	no
Warranty	1 year	2 years	2 years	2 years	2 years	2 years	1 year	90 days	90 days
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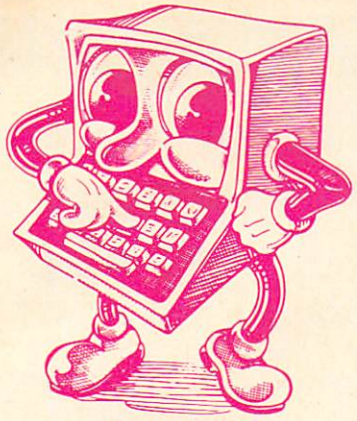
MODEM	Micro-connection TI	PConnection Modem Card	Micro-connection A1A	Micro-connection A2A	Micro-connection TC1	Micro-connection A1	Micro-connection R1A	Micro-connection T1A	Micro-connection A2
Manufacturer/ Distributor	The Micro-Distributor Corp.	The Micro-peripheral Corp.	The Micro-peripheral Corp.	The Micro-peripheral Corp.	The Micro-peripheral Corp.	The Micro-peripheral Corp.	The Micro-peripheral Corp.	The Micro-peripheral Corp.	The Micro-peripheral Corp.
Compatibility	TRS-80 Model I	IBM-PC	Atari (with 850)	Atari (no 850)	TRS-80 Color	Atari (with 850)	RS-232	TRS-80 II, III, 16	Atari
Communication Standard	Bell 103	Bell 103/113	Bell 103	Bell 103	Bell 103	Bell 103	Bell 103	Bell 103	Bell 103
Coupling Method	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect
Baud Rate	300	300	300	300	300	300	300	300	300
Duplexing	full/half	full/half	full/half	full/half	full/half	full/half	full/half	full/half	full/half
Auto-Answer	no	yes	yes	no	no	no	yes	yes	no
Auto-Originate	no	yes	yes	yes	no	no	yes	yes	no
Self-Test	no	no	no	no	no	no	no	no	no
Carrier Detection Indicator	LED	on screen	LED	LED	LED	LED	LED	LED	LED
Power Supply	AC	host computer	AC	AC	AC	AC	AC	AC	AC
Necessary Cables/ Connectors Included?	yes	yes	yes	yes	yes	yes	yes	yes	yes
Terminal Software Included?	yes	yes	yes	yes	no	yes	no	yes	yes
Warranty	90 days	90 days	90 days	90 days	90 days	90 days	90 days	90 days	90 days
Price	$209	$170	$239	$279	$199.50	$199	$199	$259	$249

MODEM	Micro-connection Auto-Print	Cat	D-Cat	Auto-Cat	212 Auto-Cat	Apple-Cat II	212 Apple-Cat II	J-Cat	103 Smart-Cat
Manufacturer/ Distributor	The Micro-peripheral Corp.	Novation, Inc.	Novation, Inc.	Novation, Inc.	Novation, Inc.	Novation, Inc.	Novation, Inc.	Novation, Inc.	Novation, Inc.
Compatibility	RS-232	RS-232	RS-232	RS-232	RS-232	Apple II, II+, IIe	Apple II, II+, IIe	RS-232	RS-232
Communication Standard	Bell 103	Bell 103	Bell 103	Bell 103	Bell 103 & 212A	Bell 103 & 202	Bell 103 & 212A	Bell 103	Bell 103
Coupling Method	direct-connect	acoustic	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect	direct connect
Baud Rate	300	0-300	0-300	0-300	0-300 & 1200	0-300 & 1200	0-300 & 1200	0-300	0-300 & 110
Duplexing	full/half	full/half	full/half	full/half	full/half	full/half	full/half	full	full
Auto-Answer	yes	no	no	yes	yes	yes	yes	yes	yes
Auto-Originate	yes	no	no	yes	yes	yes	yes	yes	yes
Self-Test	no	yes	yes	yes	yes	yes	yes	yes	yes
Carrier Detection Indicator	LED	LED	LED	LED	LED	light	light	LED	LED
Power Supply	host computer	AC	AC	AC	AC	host computer	host computer	AC	AC
Necessary Cables/ Connectors Included?	yes	yes	yes	yes	yes	yes	yes	yes	yes
Terminal Software Included?	yes	no	no	no	no	yes	yes	no	no
Warranty	90 days	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year
Price	$149.95	$189	$199	$249	$695	$389	$725	$149	$249



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Cardco . . . VIC 20 - '64' . . .	**59.95**

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Hayes Smart Modem 300 Baud	**209.95**
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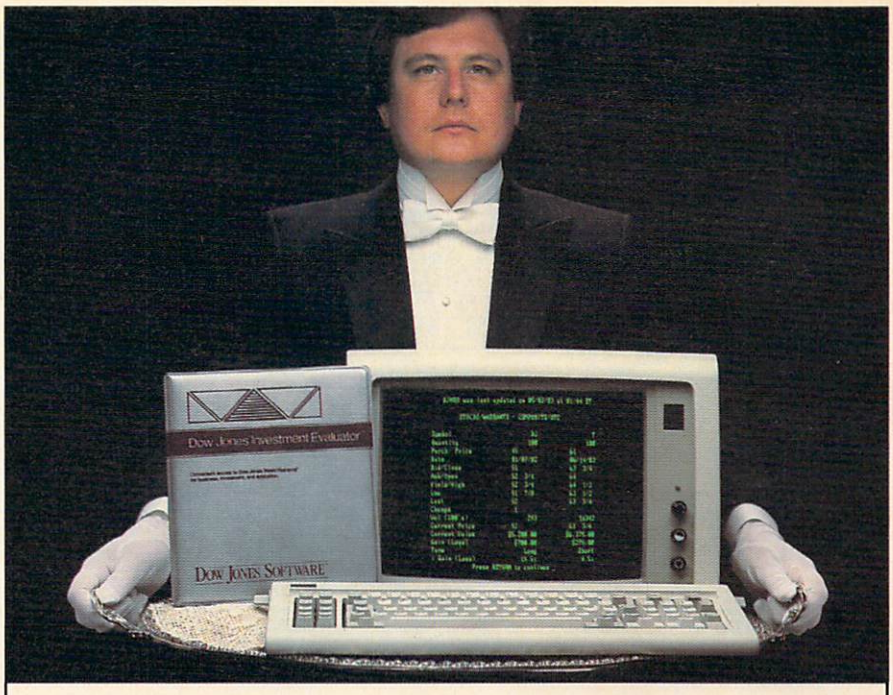

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MODEM	103-212 Smart-Cat	Star Acoustic	P-113D	P-212	VA103 Modemphone	VA315	VA317	VA355	VA1252 G/K
Manufacturer/ Distributor	Novation, Inc.	Prentice Corp.	Prentice Corp.	Prentice Corp.	Racal-Vadic	Racal-Vadic	Racal-Vadic	Racal-Vadic	Racal-Vadic
Compatibility	RS-232	RS-232	RS-232	RS-232	RS-232	RS-232	RS-232	RS-232	RS-232
Communication Standard	Bell 103 & 212A	Bell 103	Bell 103	Bell 103 & 212A	Bell 103/113	Bell 103/113	Bell 113B/113C	Bell 103/113	Bell 202
Coupling Method	direct-connect	acoustic	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect
Baud Rate	0-300 & 1200	0-300	0-300	0-300 & 1200	0-300	0-300	0-300	0-300	0-1200
Duplexing	full	full/half	full/half	full/half	full	full	full	full	full/half
Auto-Answer	yes	no	yes	yes	yes	yes	yes	yes	no
Auto-Originate	yes	no	no	no	yes	no	no	no	no
Self-Test	yes	yes	yes	yes	no	yes	yes	yes	no
Carrier Detection Indicator	LED	LED	LED	light	lamp	LED	LED	LED	LED
Power Supply	AC	AC	AC	AC	AC	AC	AC	AC	AC
Necessary Cables/ Connectors Included?	yes	yes	yes	yes	yes	yes	yes	yes	yes
Terminal Software Included?	no	yes	yes	yes	no	no	no	no	no
Warranty	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year
Price	$595	$199	$260 (rack mounted) $395 (stand-alone)	$495 (rack mounted) $595 (stand-alone)	$250-$380	$375	$250	$375	$525

MODEM	VA1250/55	VA3413	VA212PA	VA212LC	TNW-103	Operator 103	UDS-212LP	UDS-103JLP	UDS-103 O/A LP
Manufacturer/ Distributor	Racal-Vadic	Racal-Vadic	Racal-Vadic	Racal-Vadic	TNW Corporation	TNW Corporation	Universal Data Systems	Universal Data Systems	Universal Data Systems
Compatibility	RS-232	RS-232	RS-232	RS-232	PET/CBM IEEE-488	RS-232	RS-232	RS-232	RS-232
Communication Standard	Bell 202	Bell 103	Bell 103/212A	Bell 103/212A	Bell 103	Bell 103	Bell 212A	Bell 103	Bell 103
Coupling Method	direct-connect	acoustic	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect	direct-connect
Baud Rate	0-1200	0-300, 1200	0-300, 1200	0-300, 1200	300	0-300	1200	0-300	0-300
Duplexing	half	full	full	full	full/half	full/half	full	full	full
Auto-Answer	yes	no	yes	yes	yes	yes	no	yes	no
Auto-Originate	no	no	yes	no	yes	yes	no	no	no
Self-Test	yes	yes	yes	yes	yes	yes	no	no	no
Carrier Detection Indicator	LED	LED	LED	LED	on screen	beep	none	none	none
Power Supply	AC	internal	AC	AC	AC	AC	telephone line	telephone line	telephone line
Necessary Cables/ Connectors Included?	yes	yes	yes	yes	yes	yes	yes	yes	yes
Terminal Software Included?	no	no	no	no	yes	no	no	no	no
Warranty	1 year	1 year	1 year	1 year	1 year	2 years	1 year	1 year	1 year
Price	$425-$525	$695	$795	$550	$449	$189	$445	$195	$145

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Adding Peripherals

Building A Home Computer System

Ottis Cowper, Technical Editor

Taken together, peripherals can end up costing more than your computer, so making the right purchases is a must. What brand should you buy? What "extras" are needed? Will you need software just to operate your peripheral? This article helps define the more critical issues involved.

Computer enthusiasts often brag about their "systems," adding an aura of sophistication to their home setups. These systems usually consist of a basic microcomputer surrounded by an assortment of *peripherals*. Essentially, a peripheral is anything you plug into your computer.

Without even realizing it, you started adding peripherals and building your system as soon as you bought your computer. Your first peripheral was most likely a TV or video monitor, and the next was probably a cassette tape unit to load and store programs or a joystick to use with your favorite game. From there, the list of possible peripheral devices goes on and on: printers, disk drives, modems, memory expansion cartridges, light pens, speech synthesizers, plotters, etc.

It's up to you to decide which peripherals you need: a disk drive for serious word processing, a color monitor for really sharp video displays, a modem for telecommunications. The economics of the situation should dictate the amount of time you spend comparing the available models of the item you want.

If you have been shopping for any of these items, one thing you've realized, is that it's not at all unusual for a peripheral device to cost quite a bit more than the computer to which it is attached. It might take you a while to get adjusted to the idea of hooking a $600 printer up to your $100 computer. But the overriding issue is compatibility: Will the peripheral you want work with your computer system? It's easy to see that you should choose your peripherals carefully.

Which Brand Is Best?

The obvious way to guarantee that the peripheral devices you buy will work in your system is to buy them from the same company that made your computer. Another source is the alternate "third party" suppliers and many of them offer truly innovative designs.

Most home computer peripherals are someone else's product wearing a new name. The computer company buys the hardware in huge quantities from the original manufacturer and then puts on its own brand label. In many cases, a similar product is also available directly from the original maker.

The key to whether a product is a better buy from the original manufacturer or the reseller can lie in whether the reseller just slapped on a logo or whether the product was modified to optimize its performance in conjunction with a particular computer. This isn't usually something that is obvious. One way to check is to see if the peripheral supports any of the computer's special features. For example, Commodore computers have a set of built-in graphics characters which are directly accessible from the keyboard. Commodore sells a printer made by another company, but modified to print the special characters. Similar printers are available under other brand names, but the others either will not print the graphics characters or will print them only if you pay extra for an additional ROM chip and install the chip in your printer.

Read The Fine Print

Price should not be your sole concern when deciding what peripheral to buy. An important factor to consider is ease of interfacing. Again using printers as an example, a $300 printer that requires a $75 interface module to be used with your system is *not* a better buy than a $350 model that would plug in directly. Moreover, all interfaces are not

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

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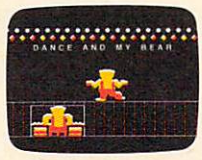

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created equal.

We recently saw an interface which could be used to connect the VIC-20 to a popular brand of dot matrix printer. We assumed at first that using the interface was simply a matter of plugging one cable from the interface into the computer and another cable into the printer. It was only when we read the fine print in the instruction manual that we discovered we had to go inside the printer and solder in a wire to provide power for the interface. Such a modification would certainly void any warranty on the printer, and should not be undertaken thoughtlessly. This is the kind of detail that you need to investigate thoroughly before you buy any peripheral that doesn't plug directly into your system.

You should also check to see if any special cables are required to connect the peripheral to your computer or to the necessary interface. Many buyers have been dismayed to arrive home with a new peripheral only to discover that a special cable is required to hook it up to their system. They can get even more dismayed when they discover that the manufacturer wants $35 for the necessary cable. Owners with some soldering experience may be able to save some money by building the cable themselves if they can find the necessary connectors, but, again, it's really not a job for beginners so you should make sure that all necessary cables are included with the peripheral.

The Software Issue

Yet another item to consider is support software. Some peripherals require no special software; others are useless without it. For example, the same light pen can be used interchangeably on an Atari, VIC, or 64. However, without software to read the light pen and convert the value for the light pen position to an equivalent screen location for your particular machine, the pen doesn't do you much good.

If you're not a sufficiently advanced programmer to write your own support software, you should be sure that programs for your computer model are included with the hardware. This is especially true for complex peripherals like speech synthesizers and plotters. If you don't get software for your computer with the device, you can face possibly spending quite a bit of time developing your own.

Lack Of Standardization

There are few standards for home computer peripherals. Much of the lack of standardization is the result of the various companies following different design philosophies. For example, the mechanical workings of all 5-1/4 inch floppy disk drives are essentially identical, but drive units for particular computers are not at all interchangeable. Using the same basic hardware, a Commodore drive stores data on the diskette in 683 256-byte sectors; a TRS-80 Color Computer drive creates 630 256-byte sectors; an Apple II drive, 560 256-byte sectors; and a Texas Instruments drive, 360 256-byte sectors. An Atari drive uses 720 sectors, but each sector is only 128 bytes long. The Commodore writes the directory on track 18 of the disk, the Apple and TRS-80 on track 17, and the TI on track 0. This not only makes the disk drives incompatible, but also means that disks written by one brand cannot be read by another. Each manufacturer has strong arguments why the particular method it chose is the best, and no one seems willing to compromise in the name of compatibility.

Interfaces

A few attempts at standardization have been made. For example, a company called Centronics was one of the first major suppliers of computer printers. Centronics used a parallel interface scheme in which data was sent to the printer one byte at a time. Companies which entered the market later used Centronics' connection so that their printers could be easily attached to computers set up for Centronics printers. So this connection scheme, with its 36-pin plug, became the de facto standard, and Centronics parallel interfaces are now available for most home computers.

A more formal standard has been established for serial data communications. The standard, called RS-232, calls for a set of wires including a transmitted data line, a received data line, and a collection of "handshaking" signal lines to regulate data transfer. Moreover, a particular type of plug called a DB25 is almost always used on RS-232 data lines, and each pin on this plug has been assigned a particular RS-232 signal. So if you have an RS-232 port on your computer, you can interface without problems to an RS-232 peripheral, right?

Unfortunately, it's not always that simple. The RS-232 standard defines a set of signal lines, but fails to specify what shall be considered a valid signal on those lines. Some RS-232 systems use +12 volts and -12 volts as the two signal levels, some use +5 volts and -5 volts, and a few others use +5 and 0 volts. For example, the VIC-20 and Commodore 64 have the ROM software built in to support RS-232 communications through the user port on the computer, but you still must plug an interface module into the user port to increase the output voltage levels before you can use most non-Commodore RS-232 devices. You should be aware of this before purchasing any RS-232 "standard" equipment.

At some point in the future, one company may come to so dominate a sufficiently large share of the home computer market that it determines the standard for everyone. Some are predicting

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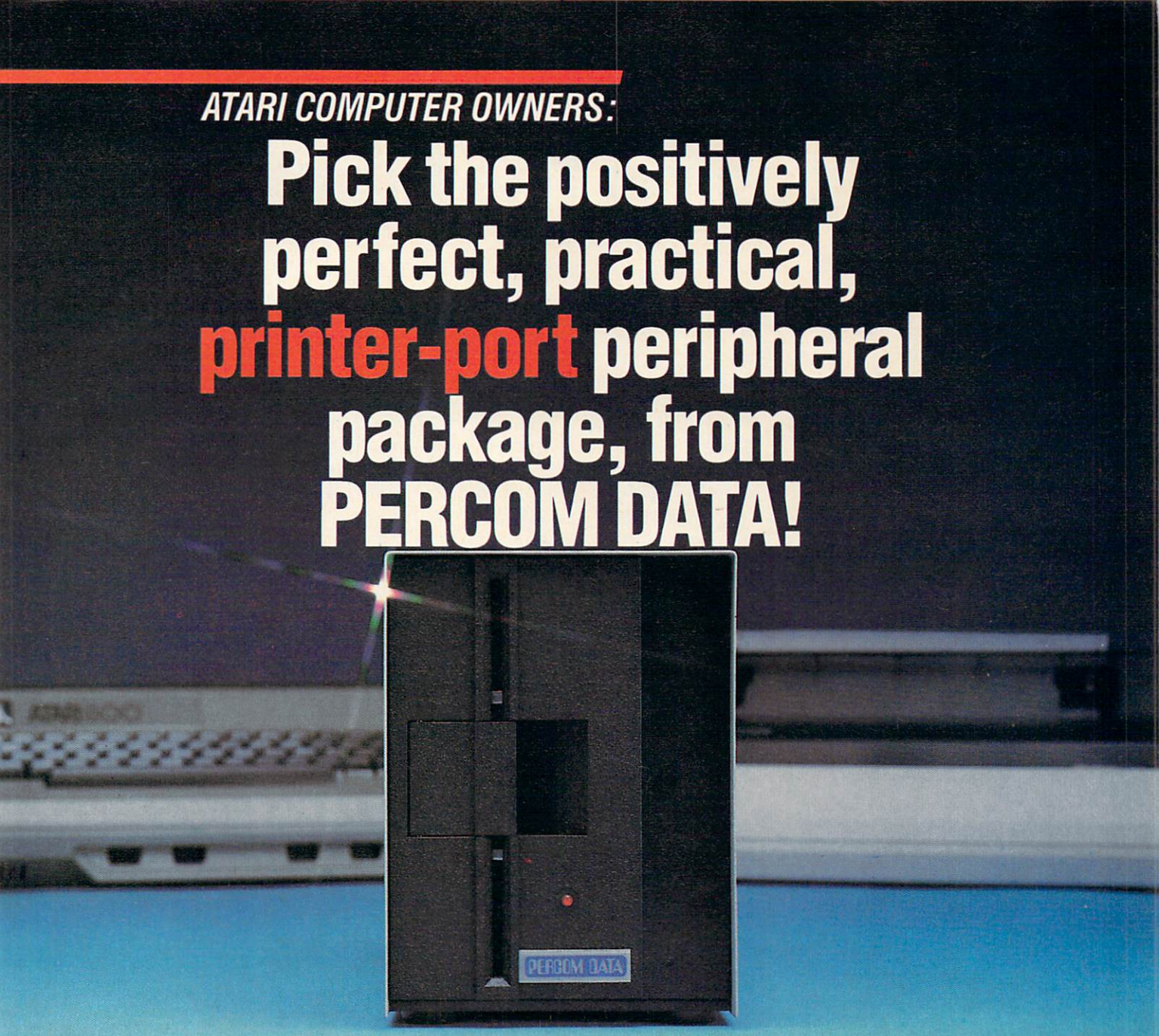

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Choosing The Right TV

Michael A Covington

"What kind of TV should I get to use with my computer?" This is a frequently asked question nowadays, and a good answer can be hard to get. Low-priced microcomputers are designed with the idea that you'll use the TV that you already have, to keep costs down. But perhaps you don't want to interrupt the whole family's TV viewing every time you want to work on a program, or perhaps there was no TV set in your home before you got a computer. In these cases, you must shop for a TV – and some TV sets are much more suitable for computer use than others.

Size And Color

The first question to be settled is, what size? That depends on whether you want to look at the screen from across the room, with the computer on the coffee table in front of you, or whether you want to put the TV on your desk right behind the keyboard. The coffee-table arrangement is usual for joystick game playing, and the ideal TV size is the same as for watching TV programs at the same distance. But a TV set that is to go on your desk should probably be in the 10- to 12-inch range; a 19-inch will be far too big to read comfortably, and even a 5-inch will give a crisp, small, very readable display, with letters about the same size as those produced by a pica typewriter.

Color or black-and-white? That depends mainly on how much money you want to spend and whether you want a color picture. For computerizing your finances or learning BASIC, you probably don't need a color display; for playing *Pac-Man*, you probably do. Very small (under-10-inch) color TV sets often show a lack of fine detail because the color phosphor dots can't be made small enough in proportion to the size of the screen; no such problem occurs with black and white.

A computer that generates a color display can of course be used with a black-and-white TV; you get a black-and-white version of the display, with different colors rendered as different shades of gray. A few computers, such as the Timex/Sinclair 1000, do not generate color.

The main thing you want out of the TV set's performance is sharpness. In the dealer's showroom, watch TV programs and commercials that place lots of lettering on the screen. Manipulate the fine tuning until the lettering is as sharp as possible, then look at the final results. An overall smeared appearance is a bad sign; the better you can get the lettering to look, the better the TV set will perform with a computer.

Convenient Controls

You also need convenient access to certain controls – volume, brightness, contrast, and, for color sets, tint and color saturation. All of these controls need readjusting when you switch between computer usage and ordinary TV viewing; they should be conveniently accessible on the front panel, not hidden away in back.

Preferably, the TV set should also have some other controls for occasional touching up: width and horizontal linearity adjustments can keep you from losing part of the display at the edges, and focus and video peaking adjustments can give you a sharper picture. These latter adjustments need touching up only rarely, so it's fine if they're on the back panel or inside. Not all TV sets have them; check a circuit diagram to be certain.

If you come across a TV with direct video and sound inputs for a video player, so much the better. You can connect your computer to them – contact the manufacturer to find out how – and get a sharper picture because the signal does not have to go through a modulator or the TV set's tuner. In fact, if you aren't interested in watching TV programs, perhaps you should buy a *monitor* – a device like a TV set without a tuner or channel selector, only a direct video input.

If your computer uses sound, make sure that the monitor has sound capability. The ones intended for use with video recorders generally do, while monitors designed for use with computers often do not. Also, there are two types of color computer monitors. Get one with a composite video input, rather than RGB direct drive, unless you are sure that the latter is what your computer requires.

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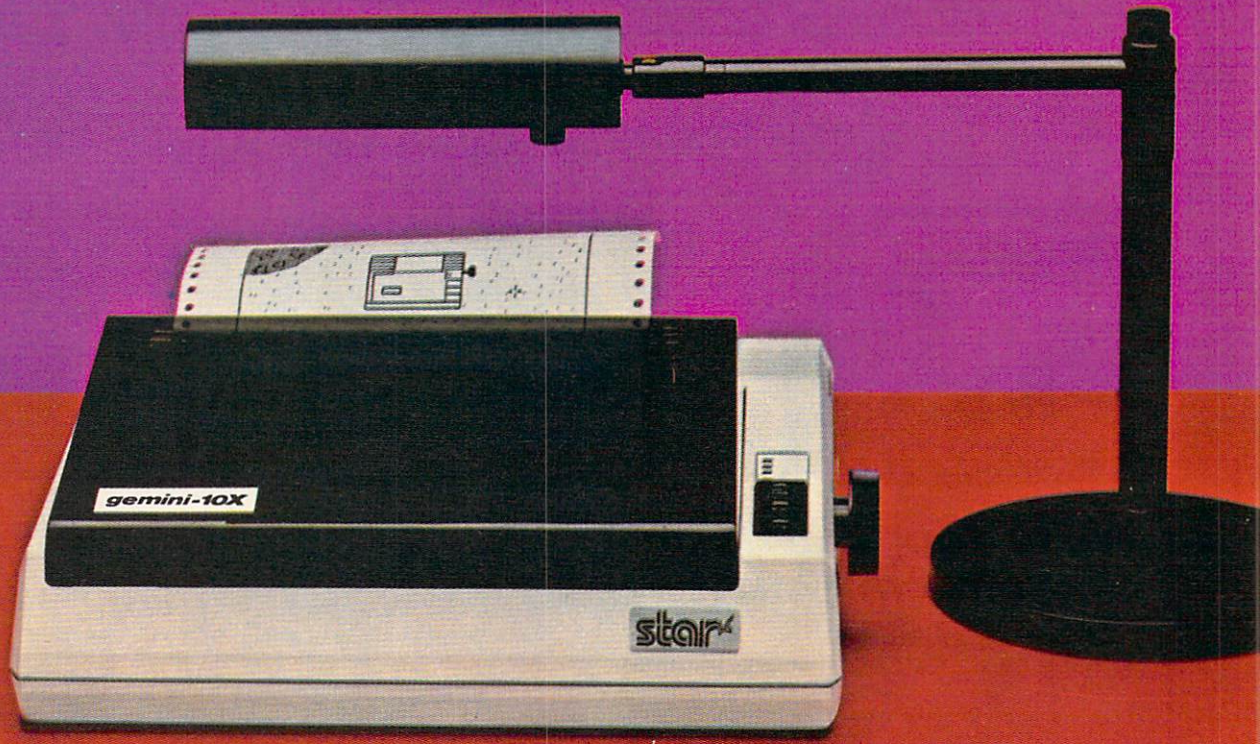

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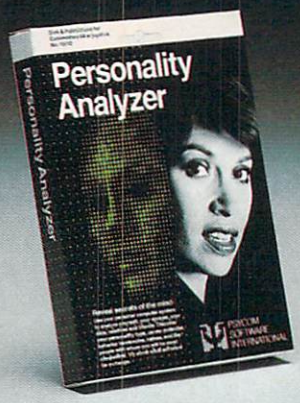

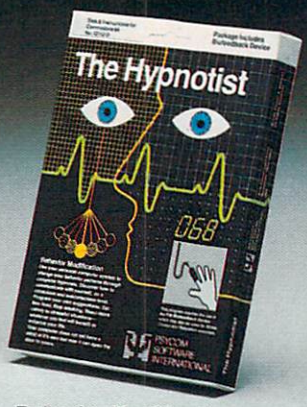

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that IBM's new home computer, due to be released soon, will become the archetype. The Japanese are reportedly attempting to develop a set of standards to reduce incompatibility problems in their new generation of home computers in the hope that they will come to be the standard. For now, the name of the game is caveat emptor, let the buyer beware. For any given computer there is much more incompatible than compatible equipment available. ©

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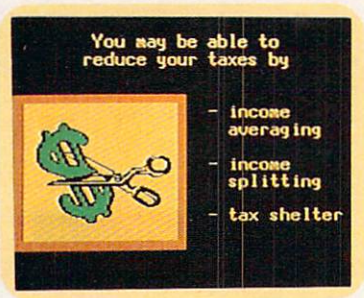

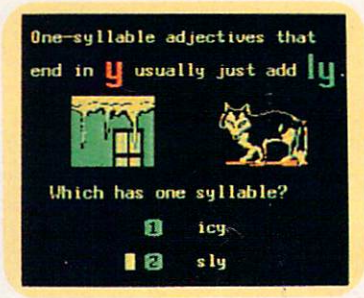

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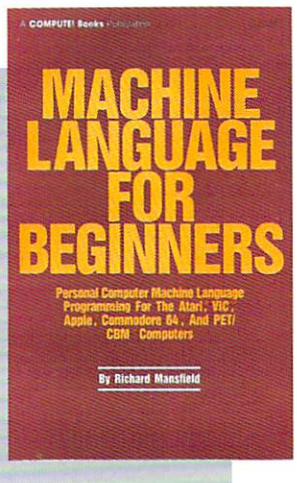

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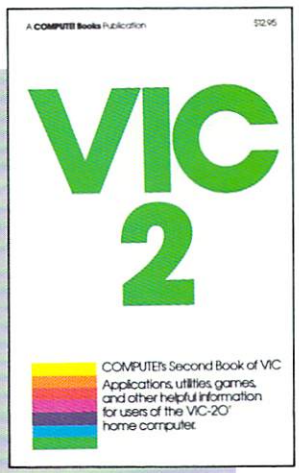

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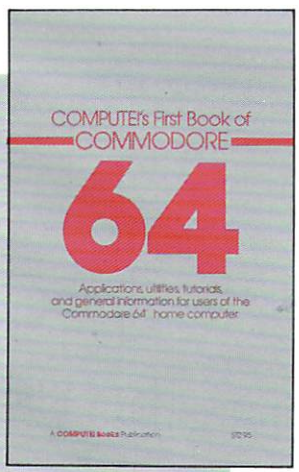

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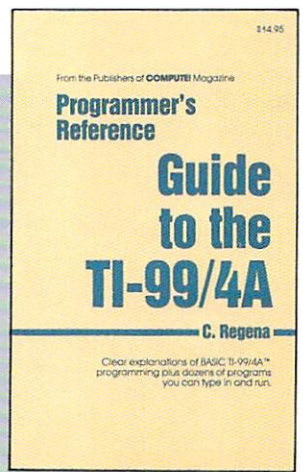

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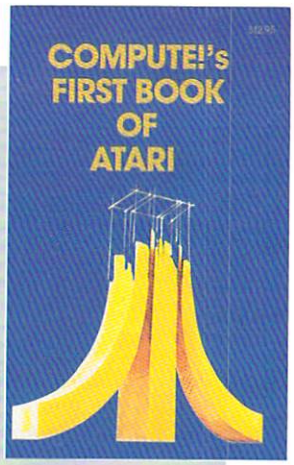

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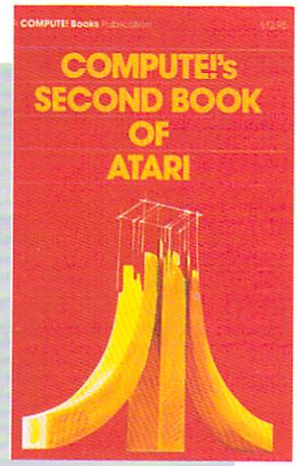

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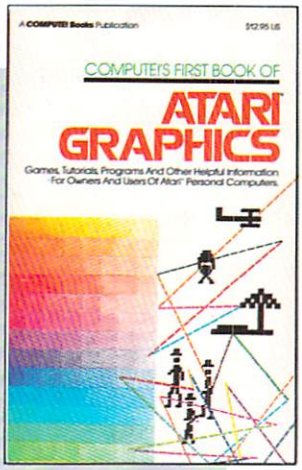

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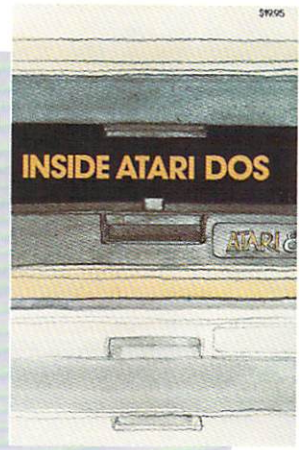

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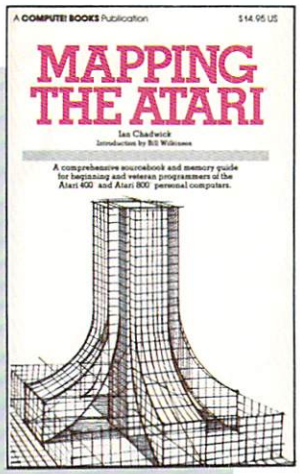

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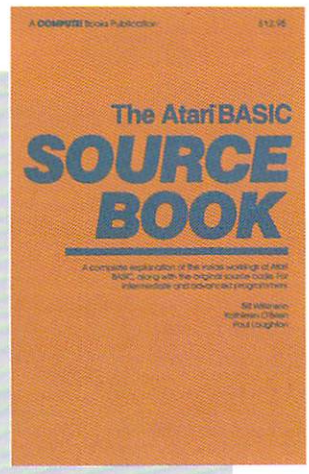

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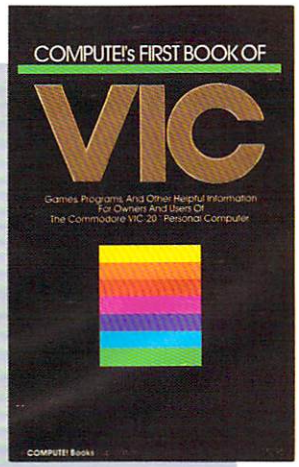

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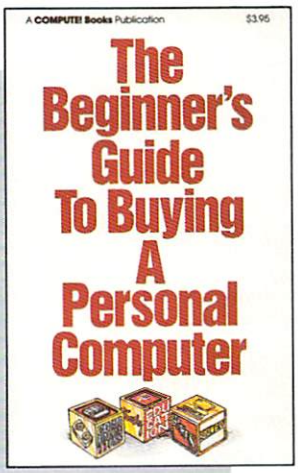

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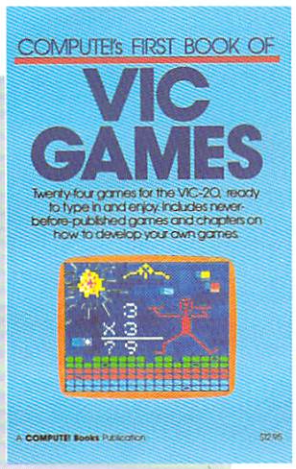

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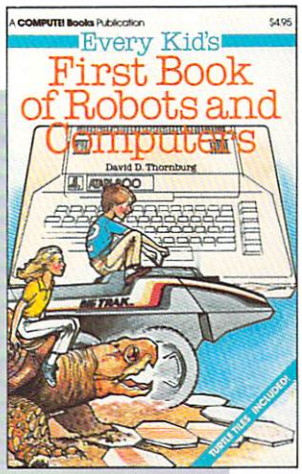

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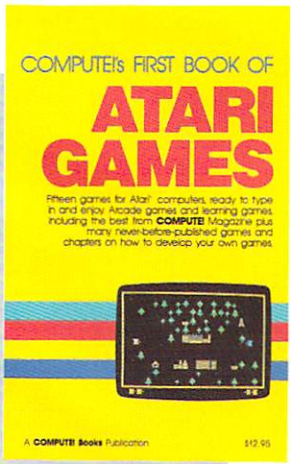

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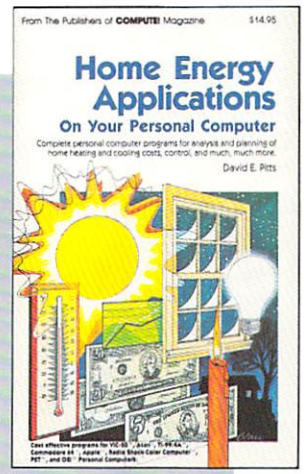

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Guest Commentary

The High Cost Of Personal Telecommunications

Robert Braver

As telecommunication becomes an increasingly important aspect of home computing, the telephone rates and hookup fees are of interest to both the consumer and the telephone companies. Robert Braver, President of the Oklahoma Modem Users Group, raises some important issues in this guest commentary. We contacted Southwestern Bell of Oklahoma, and the remarks of their spokesperson are included.

Sometime in mid-May, 1983, I called my local Bell business office to request that a trace be placed on my bulletin board system's phone line. Someone had been calling up my system and tying it up for an hour at a time by sitting at the prompt which asks for a user ID number.

When requesting a trace, you must describe the type of calls you have been receiving. I thought that since these calls were not voice messages, there would more than likely be confusion when I tried to explain things to the business office representative. I expected to need about half an hour to explain exactly what a modem and bulletin board system is. After all, I had to do that when I first had the phone line installed a year ago.

There Must Be Some Mistake

To my surprise, she seemed to know all about modems. In fact, she informed me that since I used a modem on my phone line, I would have to pay a higher monthly phone rate.

Of course, I thought she must be mistaken. Perhaps she was referring to the "Data Perfect" lines, which are used for high-speed (2400 baud) transmissions. I didn't need a special line for my relatively slow 300 baud modem. Even 1200 baud modems do fine on ordinary phone lines.

After about two weeks of arguing with Bell business office representatives, insisting that there must be some mistake, I received a copy of a tariff sheet from the Oklahoma Corporation Commission. Bell was right. Their tariffs do call for the charging of a higher rate for connecting a computer using a modem to the phone lines.

This section of Southwestern Bell's Oklahoma tariffs, called Information Terminal Service tariffs, was written in the mid-sixties. Obviously, this was long before there were home computers. When the tariffs were written, generally the only modem users were large corporations transmitting data 24 hours a day. Therefore, the rates for having a computer or similar device connected to the phone lines with a modem were somewhat higher.

Because there were no home computers when the tariffs were written, Bell had no reason to distinguish between commercial and residential modem use. And now, almost 20 years later, Southwestern Bell is using those tariffs to charge personal computer users *five times* their normal phone rate if they wish to use modems with their personal computers.

An Organized Response

Since this tariff would seriously inhibit home modem use in Oklahoma, I immediately organized the Oklahoma Modem Users Group, or OMUG, to challenge Southwestern Bell and its unfair tariff.

OMUG's main goal is to organize the modem users of Oklahoma and to undertake whatever legal proceedings are deemed necessary to force Bell to exempt home modem users from the Provisions of Information Terminal Service tariffs.

As of this writing, legal proceedings are still in the future. OMUG has recently been raising funds and attempting to gain the support of home computer and modem manufacturers. OMUG has also been publicizing the situation to make sure that all modem users nationwide as well as

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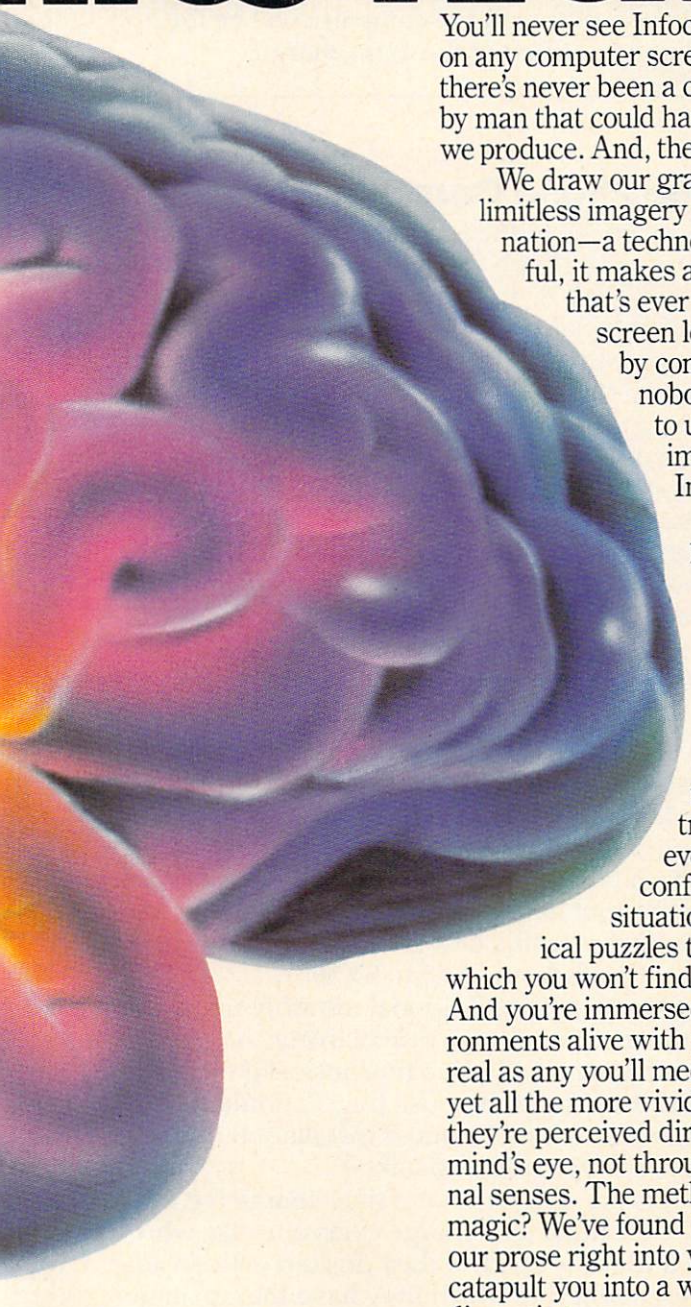

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the general public know about this problem.

Not Limited To Oklahoma

This situation, it turns out, may not be unique to Oklahoma. There are similar outdated tariffs in other states. And many experts in the industry seem to think that if Southwestern Bell is justified in charging higher rates to modem users in Oklahoma, it is just a matter of time before other states adopt similar tariffs or start enforcing their present tariffs (also written in the sixties).

According to the tariff, anyone connecting "customer-provided data transmitting and receiving equipment that processes data and/or performs calculations" including computers, associated buffering devices, and/or concentrating devices with store and forward capabilities would all be subject to the higher rate. Although dumb terminals do not fall under the tariff, computers emulating dumb terminals do. And anyway, most terminal software packages have memory buffers, auto-logon capabilities, and other features. Furthermore, most so-called dumb terminals on the market today have memory buffers and microprocessors, which cause them to also fall under the tariff.

Information Terminal Service is considered a business service. Therefore, as of July 11, 1983 (when Bell raised my rate), if I have a problem with the modem line, I don't call the residential division, but the business division of the Bell business office. As a "business," I am entitled to a free yellow pages listing in the telephone directory. But since I do not run a business, and having the ad might hamper chances of obtaining a court order to restore my old rate, I declined the free listing.

But even without the yellow pages listing, I was told by the manager of the Bell business office that once a line is classified as a business, it cannot be restored to residential status. I would have to have the line disconnected, and pay $80 to have a new number installed.

Is The Phone Company Justified?

Bell seems to think that its tariff is perfectly justified. Southwestern Bell's Rate and Separations Division Manager Charles Sutter spoke to a group of 40 home computer owners here in Oklahoma City in response to the outrage over the tariff. He was asked how Bell could justify charging a personal computer owner who uses CompuServe once a week the same rate as a large corporation transmitting data 24 hours a day. Sutter replied, "Well, I don't know how much you use your modem."

There is no physical justification for an additional charge for modems. Modems operating at speeds of up to 1200 baud do not require special lines. The four frequencies that 300 baud modems use are among the frequencies in human speech, and easily fall between the 300-3000 Hz bandwidth of an ordinary telephone line.

And for most modem users, on-line time doesn't increase phone usage any more than having a teenager does.

But Bell persists in charging the higher rate. Although representatives claim that Bell is not actively pursuing computerists with modems, anyone who follows the law and registers his modem with the phone company will be immediately notified of the extra charge.

The Phone Company Replies

In response to the issues raised here concerning the extra charges imposed on modem users, Walt Beiter, an official of Southwestern Bell of Oklahoma, told us: "With the spread of computer terminals in the home, we recognize that the situation has changed. We're going to redesign our rates." The old rate schedule "didn't specify home, business, whatever. But we do realize that the conditions have changed. We've filed an application and expect to have hearings on this issue this fall."

In the Oklahoma City and Tulsa areas, we have a flat-rate system for phone billing. We pay a basic flat rate of $8.95 for a residential phone line. This allows you to dial anywhere in the local calling area at no additional charge. If you want to attach your computer to the phone lines via a modem, that flat rate jumps to $45.90. Also, the additional monthly charge for Touch-Tone dialing almost triples from $1.25 to $3.50.

On top of the additional monthly rates, Southwestern Bell also retroactively charged me the difference between a business and residential phone installation because they "should have charged [me] for a business installation in the first place. [They] made a mistake."

It is my opinion that if they charge me this rate, they must also charge everyone else who falls under the tariff. If they do start actively enforcing the tariff, which they have the capability to do, there wouldn't be much modem use in Oklahoma. And modem sales in the state would almost cease entirely.

If Oklahoma is just a test, and no one takes any concrete, effective action, there is a good possibility that this is just the beginning of unreasonable charges for personal telecommunication. ©

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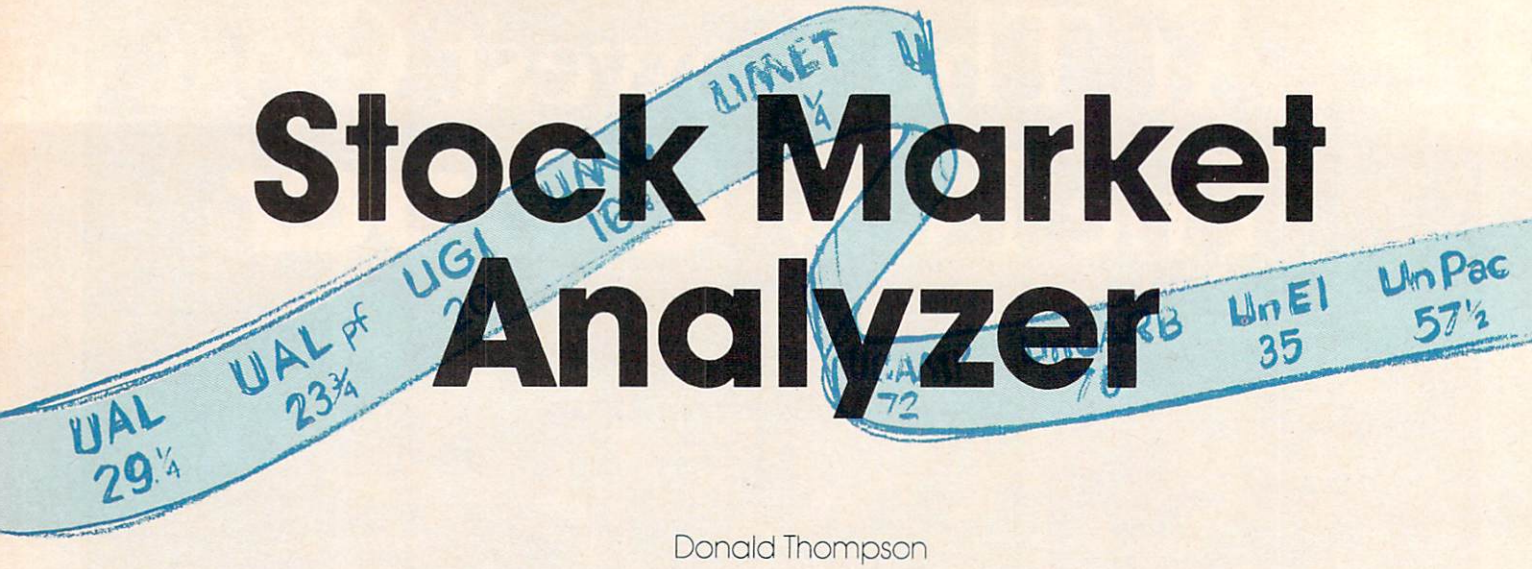
Stock Market Analyzer



Donald Thompson

Do you invest in stocks or bonds? If you like to play the stock market, this program, originally written for the Commodore 64 or 8K-expanded VIC, can help you monitor your investments more carefully – even helping you decide when to sell or buy. An Atari version is included. Of course no stock investment plan is foolproof. You might want to try this program out by playing the market on paper before putting down any real money to see if it fits your investment psychology.

Managing your stock investments can be a full-time job. "Stock Market Analyzer" provides the means to watch the progress of various stocks and record purchases and sales. The program includes a graph of the stock's price fluctuations and a guide to whether you should buy or sell a stock at any particular time. You can also see a list of transactions for each year for your tax records.

The theory behind this program is that as stocks fluctuate, the best way to invest is to put only half as much as you otherwise would in a given stock. If the stock goes up, you make money. If the stock goes down, it becomes an even better buy, so you can then invest some of the money that you have in reserve.

Using The Options

Using Stock Market Analyzer is fairly easy. After typing in the program, SAVE it to tape or disk and then type RUN. A listing of stock abbreviations will appear at the top of the screen, and you'll see seven options:

1 Search one stock
2 List stocks for any one month
3 Update DATA statements for new month
4 Buy or sell advice
5 Store data for transactions
6 Graph progress of any of your stocks
7 List transactions by year for tax purposes

Sample stock entries are included in the program. It is a good idea to run the program with the examples before entering the data for your own portfolio. Doing this will give you a better idea of how the program works. You can then enter your own stock symbols, number of shares, and initial cost in place of the sample entries.

You must update each stock price once a month or after each transaction. Before you update a stock price, make sure that you have included the necessary background data for the stock (lines 500-549). The information required for these lines is stock symbol, number of shares you have purchased (0 if you wish only to monitor the stock price), and net cost for the stock (again, 0 for monitoring only). Also set Y (in line 549) equal to the number of stocks being considered. Once you have entered this data, save the program and run it whenever you wish to update monthly stock prices or transactions.

To update monthly stock prices, run the program and use option three to produce DATA statements. Press Y in response to the INPUT DATA prompt, and press RETURN over the data lines which appear on the screen. To update stock transactions, use option five to produce DATA statements. Again, press RETURN over the printed data lines. The DATA statements from these two options are in two forms. DATA statements based on monthly updates store the date for month and year. The DATA statements based on stock transactions store the date including year,

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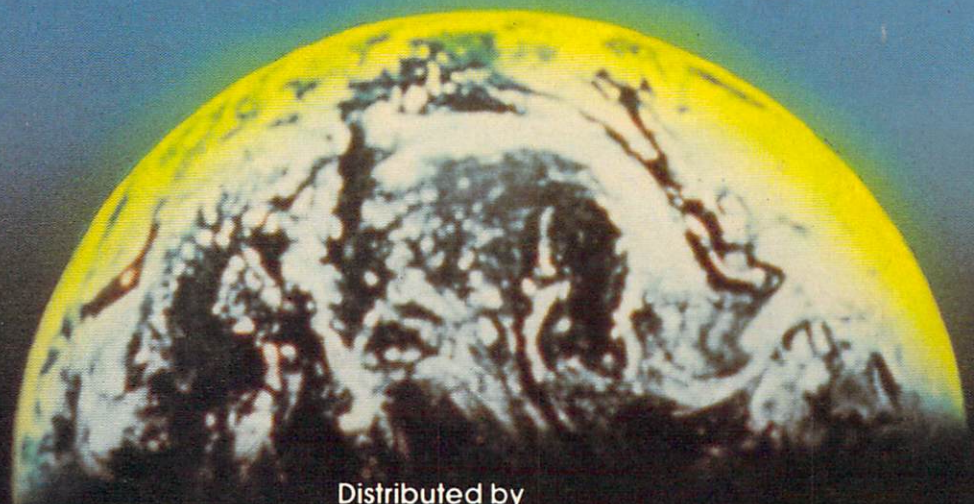

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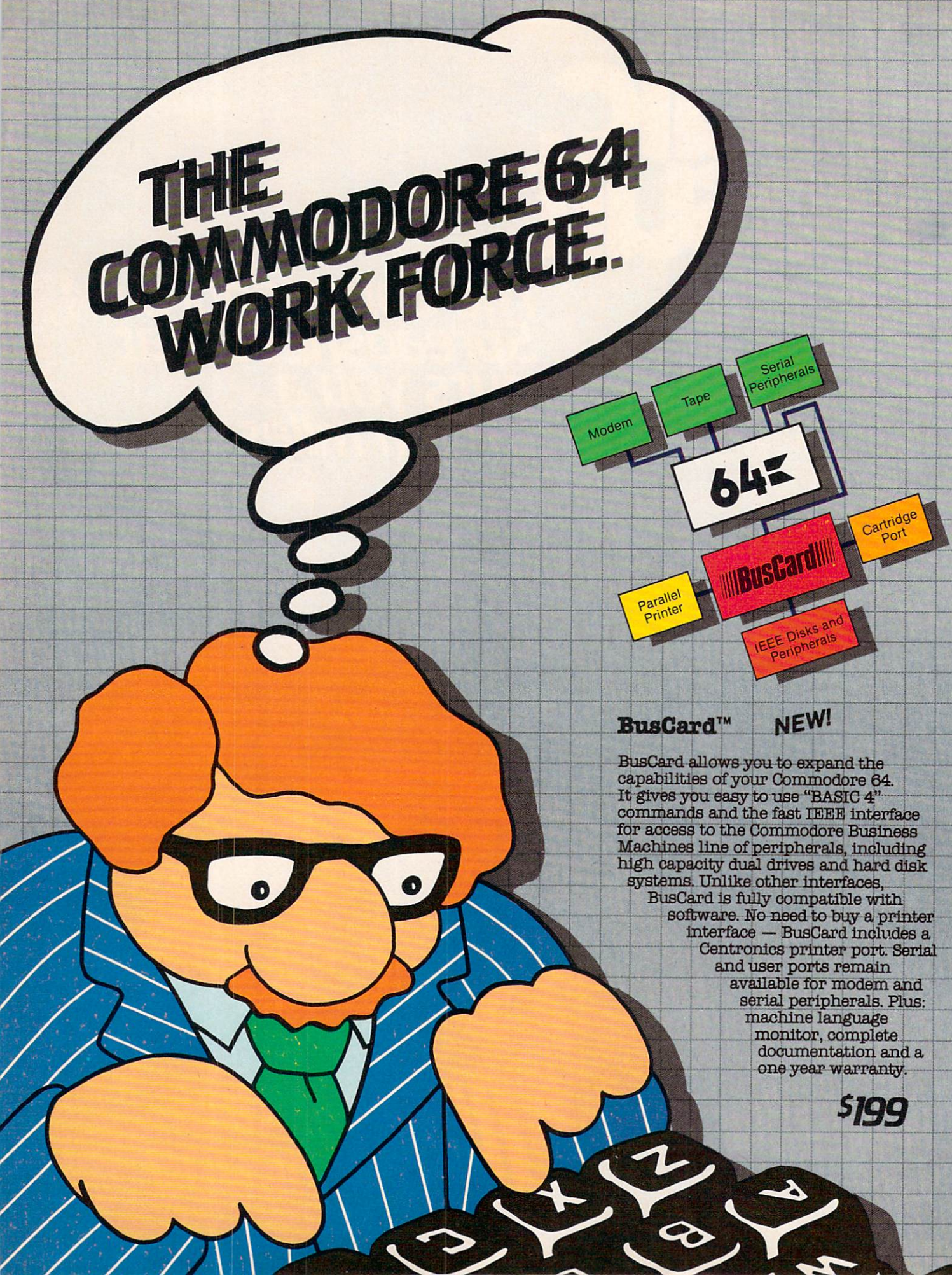

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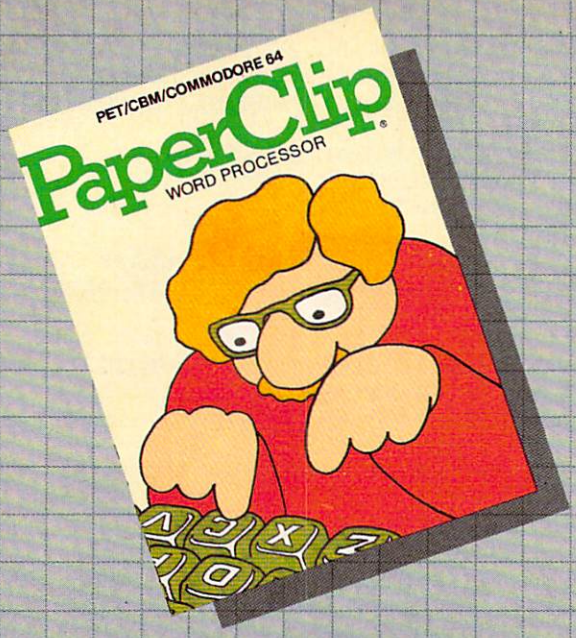

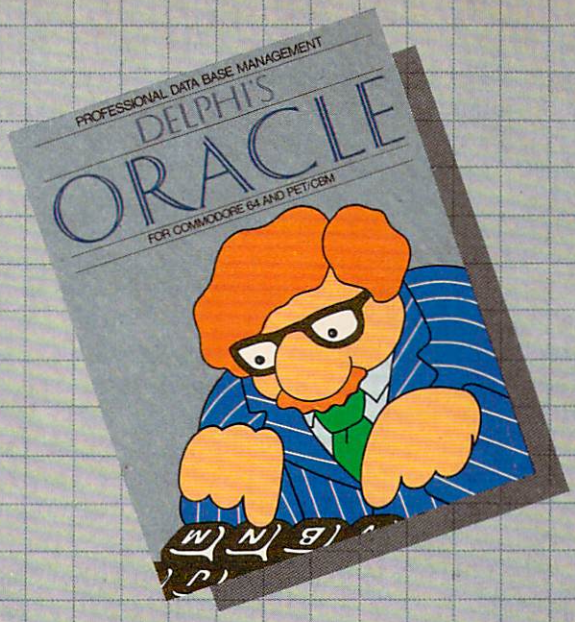

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month, and day. This difference allows the program to distinguish between monthly updates and transactions. If you want to clear out the oldest DATA, then, in immediate mode, type GOTO 20040. Each time the routine beginning at this line is executed, the first three DATA statements containing the earliest stock data will be deleted.

Keep in mind that the program is designed to monitor the cost factor involved in buying and selling stocks, as well as the actual purchase price of a stock. Under normal circumstances, transactions under $300 are not practical since such transactions include high brokerage fees.

Buy and sell advice is activated when the stock moves outside a range of values, which is determined in the subroutine beginning in line 850.

There is, of course, no perfect method to guide investors in trading in the stock market. Stock Market Analyzer is simply an aid to help you keep track of your investments and to offer an alternative way of making choices.

Program 1:
Stock Market Analyzer – VIC (8K)/64 Version

```
10 PRINT"{CLR}STOCK MARKET ANALYZER"
12 FORX=1TO500:NEXT
25 DIMS$(50),FF(50),P(50),SA(50),R$(50),T
   P(50)
30 PRINT"{CLR}":T=0:GOSUB500
32 PRINT"{CLR}THESE ARE THE STOCKS I HAVE
    IN MEMORY"
35 FORX=1TOYSTEP2
40 PRINTS$(X);TAB(5)S$(X+1):NEXTX
45 Q=0
50 C=0:T=0
60 F= 1022
95 PRINT"CHOICES AVAILABLE HIT":PRINT
96 PRINT"SEARCH STOCK{8 SPACES}1"
97 PRINT"STOCKS AT A DATE{4 SPACES}2"
98 PRINT"MONTHLY STK PRICES{2 SPACES}3"
99 PRINT"BUY OR SELL ADVICE{2 SPACES}4"
100 PRINT"STORE BUYS/SALES{4 SPACES}5"
101 PRINT"GRAPH A STOCK{7 SPACES}6"
102 PRINT"TRADES IN ANY{2 SPACES}YEAR 7"
105 GETQ:IFQ=0THEN105
106 ONQGOTO110,200,300,400,700,920,650
107 GOTO30
110 INPUT"WHICH STOCK";A$
111 RESTORE
112 GOSUB900
120 FORX=1TO1000
130 READAA$,BB$,CC$,DD,EE,FF,GG
140 IFA$=AA$THENGOSUB800
150 IFAA$="XXXX"THENX=1000:NEXTX:GOTO160
155 NEXTX:GOTO160
160 PRINT:PRINT"{5 SPACES}HIT ANY KEY "
170 GETB$:IFB$=""THEN170
180 GOTO30
200 PRINT
205 RESTORE
210 PRINT"STOCKS-DATE YRMM":INPUTD$
215 IFLEN(D$)<>4THEN210
216 D=VAL(D$):GOSUB900
220 FORX=1TO1000
221 READAA$,BB,CC$,DD,EE,FF,GG
222 IFBB=DTHENBB$=STR$(BB):GOSUB800
226 IFAA$="XXXX"THENX=1000:NEXTX:GOTO240
228 NEXTX
240 PRINTTAB(5)"TOTAL IS";T:PRINT"
    {5 SPACES}HIT ANY KEY"
241 GETB$:IFB$=""THEN241
242 GOTO30
300 PRINT"{CLR}{2 DOWN}TO CALCULATE TODAY
    'S{2 SPACES}VALUES AND CREATE DATA ST
    ATEMENTS I NEED"
306 GOSUB500
307 PRINT"TODAYS DATE(YRMM)":INPUTG
308 PRINT"YOU HAVE";Y;"STOCKS-"
309 PRINT"FROM STOCK# TO STOCK#":INPUTT,U
310 FORX= TTOU
312 PRINT"PRICE OF{4 SPACES}";S$(X)
315 INPUTP(X)
320 NEXTX:PRINT"{CLR}{4 DOWN}"
325 FORX=TTOU
330 GR$="":GR$=STR$(F)+"DATA "+S$(X)+","+
    STR$(G)+",H,0,0,"+STR$(FF(X))+","
335 PRINT GR$+STR$(P(X))
338 F=F+1
339 PRINT
340 NEXTX
345 PRINT"60 F=";F:PRINT"RUN
350 PRINT"HIT Y TO INPUT DATA"
351 GETT$:IFT$=""THEN351
355 IFT$="Y"THENPRINT"{HOME}":END
356 GOTO300
400 PRINT"{CLR}{3 DOWN}THE PATTERN FOR RE
    COMMENDING SALES IS BASED ON INCREASI
    NG AND ";
401 PRINT"DECREASING PRICES"

405 PRINT"TODAYS PRICES ARE"
410 FORX=1TOY
411 PRINT"{DOWN}{2 RIGHT}"
412 PRINTS$(X);:PRINT"{2 SPACES}TODAYS PR
    ICE=":INPUTP(X)
415 NEXTX
420 FORX=1TOY
425 GOSUB850
440 PRINTS$(X);"{2 SPACES}";R$(X);"
    {2 SPACES}";MR
445 IFR$(X)="H"THEN PRINT"NO TRADE RECOMM
    ENDED"
450 NEXTX
480 PRINT"DONE{DOWN} HIT ANY KEY"
485 GETZ$:IFZ$=""THEN485
499 GOTO30
500 S$(1)="AGOL":FF(1)=600:SA(1)=3375
501 S$(2)="TRVMF":FF(2)=200:SA(2)=726.6
503 S$(3)="EAL":FF(3)=0:SA(3)=0
504 S$(4)="SEAG":FF(4)=100:SA(4)=9280
505 S$(5)="CASH":FF(5)=1:SA(5)=55
506 S$(6)="FLYT":FF(6)=100:SA(6)=3020
507 S$(7)="SMKV":FF(7)=1000:SA(7)=5220
549 Y=7
550 RETURN
601 PRINT"{HOME}{17 DOWN}";
610 FORS=1TOX:PRINT"{RIGHT}";:NEXTS
615 IFHI=0THENGOTO640
620 FORT=1TOINT(15/HI)*TP(X):PRINT"{UP}";
    :NEXTT
625 IFS>20THENPRINT"{UP}";GOTO20040
630 PRINT"*";
635 PRINT"{HOME}"
640 RETURN
650 RESTORE
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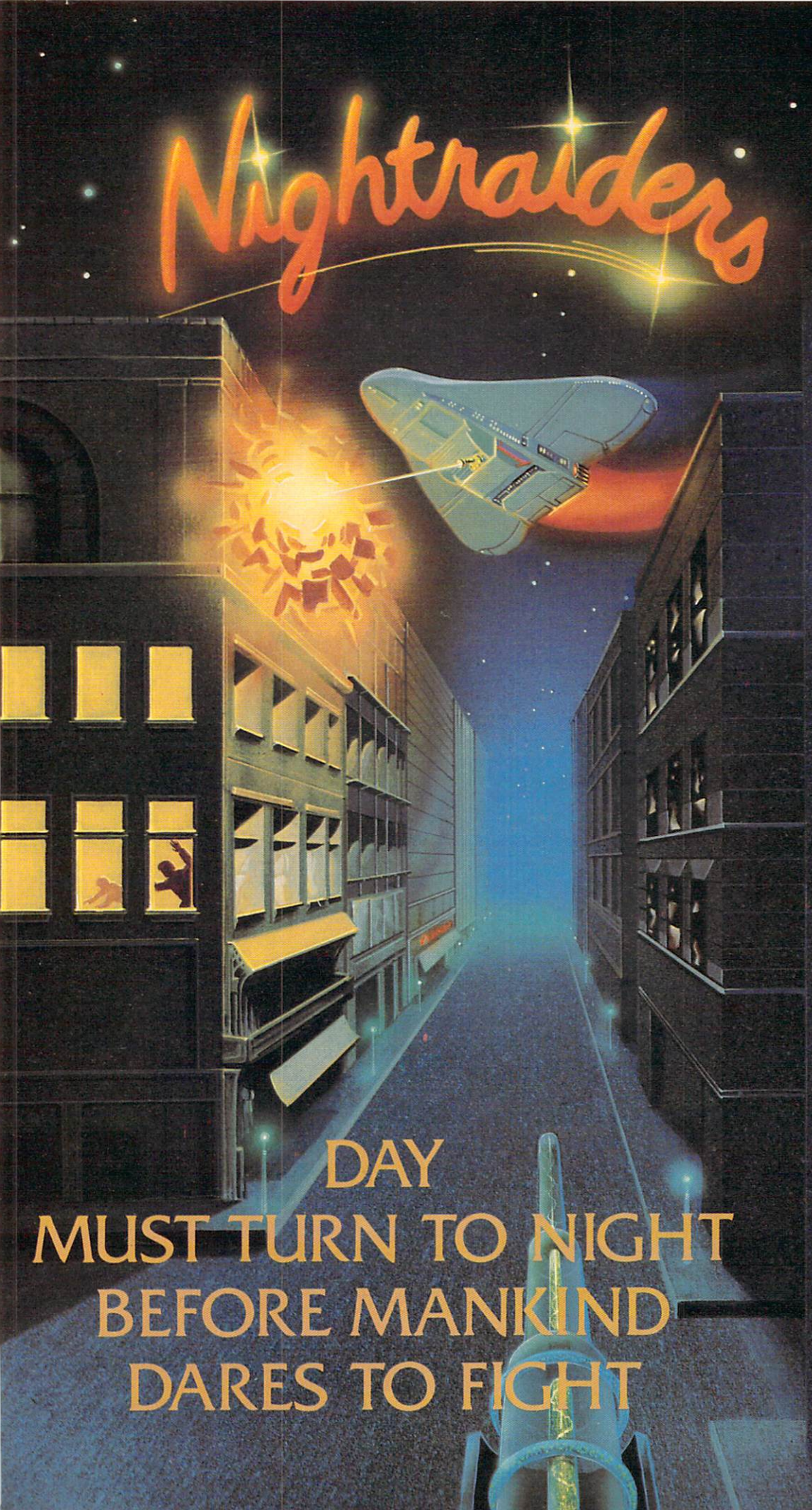

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```
652 PRINT"YEAR OF PORTFOLIO-YR";INPUT;D
654 IFD=ØTHEN21Ø
656 GOSUB9ØØ
658 FORX=1TO1ØØØ
66Ø READAA$,BB,CC$,DD,EE,FF,GG
662 IFD=INT(BB/1ØØØØ)THENGOSUB8ØØ
664 IFAA$="XXXX"THENGOTO68Ø
668 NEXTX
67Ø GOTO78Ø
675 C=Ø:GETD$:IFD$=""THEN675
676 GOTO668
68Ø PRINTTAB(5)"{4 SPACES}HIT ANY KEY "
681 GETB$:IFB$=""THEN681
685 GOTO3Ø
7ØØ PRINT"{CLR}{3 DOWN}STORING NEW TRANSA
    CTIONS"
71Ø PRINT"THERE ARE SEVERAL LINE STATEMEN
    TS THAT MUST BE CHANGED"
725 PRINT"TODAYS DATE-YYMMDD":INPUT DA
728 PRINT"WHICH STOCK":INPUTSO$
73Ø PRINT"BUY(B){2 SPACES}OR SELL(S)":INP
    UT{2 SPACES}S$
735 PRINT"HOW MANY SHARES":INPUT SH
737 PRINT"WHAT PRICE":INPUT P
741 FORX=1TOY:IFSO$=S$(X)THENTE=X:X=Y:NEX
    TX:GOTO745
742 NEXTX
745 INPUT"NET COST OR PROCEEDS";NP
747 IF S$="B"THEN NW=SA(TE)+NP:NF=FF(TE)+
    SH:GOTO 75Ø
748 NW=SA(TE)-NP:NF=FF(TE)-SH
75Ø PRINT"FF(X) BETWEEN 5ØØ-6ØØ IS";NF
752 PRINT"SA(X) SHOULD BE";NW
755 PRINT"IT SHOULD BE ABOUT";TE-1;"DOWN"
756 GR$="":GR$=STR$(F)+"DATA "+SO$+","+ST
    R$(DA)+","+S$+","+STR$(SH)
757 GR$=GR$+","+STR$(NP)+","+STR$(NF)+","
    +STR$(P)
76Ø PRINTGR$
768 PRINT"6Ø F=";F+1
77Ø PRINT"RUN
775 PRINT"HIT ANY KEY BUT N TO ENTER DATA
    "
78Ø GETY$:IFY$=""THEN78Ø
782 IFY$="N"THEN7ØØ
783 END
8ØØ REM ROUNDING
8Ø1 DD$=STR$(DD):FF$=STR$(FF):IFLEN(DD$)=
    1THENDD$=DD$+"{2 SPACES}"
8Ø2 L=EE:GOSUB3ØØØØ:EE$=JS$:IFLEN(FF$)=2T
    HENFF$=FF$+" "
8Ø3 IFLEN(DD$)=2THENDD$=DD$+"
    {SHIFT-SPACE}"
8Ø4 L=GG:GOSUB3ØØØØ:GG$=JS$:IFLEN(FF$)=1T
    HENFF$=FF$+"{2 SPACES}"
8Ø5 L=INT(FF*GG):GOSUB3ØØØØ:HH$=JS$
8Ø8 PRINT"STOCK{2 SPACES}";AA$:PRINT"DATE
    {3 SPACES}";BB$:PRINT"BUY/SELL ";CC$:
    PRINT"NUM{3 SPACES}";DD$
8Ø9 PRINT"$NET{3 SPACES}";EE$:PRINT"CUR#
    {2 SPACES}";FF$:PRINT"MARKET ";GG$:PR
    INT"VALUE{2 SPACES}";HH$
81Ø PRINT"HIT SHIFT TO CONTINUE"
811 IF(PEEK(653)AND1)=ØTHEN811
812 PRINT"{CLR}"
815 T=T+FF*GG
82Ø RETURN
85Ø MP=FF(X)*P(X):R$(X)="H":MR=Ø
855 IFMP>SA(X)*1.1THENR$(X)="S":MP=MP-MP*
    Ø.1:MR=MP-SA(X)
856 IFMP<SA(X)*.9THENR$(X)="B":MP=MP+MP*Ø
    .1:MR=SA(X)-MP
858 IF (MR<3ØØ) AND (MR>-3ØØ) THEN R$(X)=
    "H"
865 RETURN
9ØØ PRINT"{CLR}"
9Ø1 RETURN
92Ø INPUT"WHICH STOCK";WH$:V=Ø:RESTORE
925 FORX=1TO1ØØØ
93Ø READA$,B,C$,D,E,F,G
932 IFB>1ØØØØTHEN94Ø
935 IFWH$=A$THENV=V+1:TP(V)=G
936 IFA$="XXXX"THENGOTO945
94Ø NEXTX
945 REM-CREATE GRAPH
946 I=1:HI=Ø:LP=1Ø
95Ø FORX=ITOV
951 IFHI<TP(X)THENHI=TP(X)
952 IFLP>TP(X)THENLP=TP(X)
953 NEXTX
96Ø PRINT"{CLR}{3 DOWN}"
962 FORX=1TO13:PRINTCHR$(182):NEXTX
964 FORX=1TO2Ø:PRINTCHR$(162);:NEXTX
97Ø FORX=1TOV
975 GOSUB6Ø1
98Ø NEXTX
981 PRINT"{HOME}HIGH ";HI;" LOW";LP
982 PRINT"{3 RIGHT}STOCK IS ";WH$
983 PRINT"{15 DOWN}":FORX=1TOV:PRINTTP(X)
    ;:NEXTX
99Ø GETQQ$:IFQQ$=""THEN99Ø
995 GOTO3Ø
1ØØØ DATA AGOL, 83Ø1,H,Ø,Ø, 5ØØ, 5.5
1ØØ1 DATA TRVMF, 83Ø1,H,Ø,Ø, 2ØØ, 4
1ØØ2 DATA EAL, 83Ø1,H,Ø,Ø, Ø, 6.5
1ØØ3 DATA SEAG, 83Ø1,H,Ø,Ø, 1ØØ, 95
1ØØ4 DATA CASH, 83Ø1,H,Ø,Ø, 1, 55
1ØØ5 DATA FLYT, 83Ø1,H,Ø,Ø, 1ØØ, 35
1ØØ6 DATA SMKV, 83Ø1,H,Ø,Ø, 1ØØØ, 5.5
1ØØ7 DATA AGOL, 83Ø2,H,Ø,Ø, 5ØØ, 6
1ØØ8 DATA TRVMF, 83Ø2,H,Ø,Ø, 2ØØ, 5
1ØØ9 DATA EAL, 83Ø2,H,Ø,Ø, Ø, 7
1Ø1Ø DATA SEAG, 83Ø2,H,Ø,Ø, 1ØØ, 1ØØ
1Ø11 DATA CASH, 83Ø2,H,Ø,Ø, 1, 58
1Ø12 DATA FLYT, 83Ø2,H,Ø,Ø, 1ØØ, 39
1Ø13 DATA SMKV, 83Ø2,H,Ø,Ø, 1ØØØ, 6
1Ø14 DATA AGOL, 83Ø3,H,Ø,Ø, 5ØØ, 4.5
1Ø15 DATA TRVMF, 83Ø3,H,Ø,Ø, 2ØØ, 6
1Ø16 DATA EAL, 83Ø3,H,Ø,Ø, Ø, 4
1Ø17 DATA SEAG, 83Ø3,H,Ø,Ø, 1ØØ, 85
1Ø18 DATA CASH, 83Ø3,H,Ø,Ø, 1, 43
1Ø19 DATA FLYT, 83Ø3,H,Ø,Ø, 1ØØ, 37
1Ø2Ø DATA SMKV, 83Ø3,H,Ø,Ø, 1ØØØ, 7
1Ø21 DATA AGOL, 83Ø4Ø3,B, 1ØØ, 775, 6ØØ,
    {SPACE}7.5
2ØØØØ DATAXXXX,Ø,X,Ø,Ø,Ø,Ø,Ø
2ØØ3Ø REM A SHORT PROGRAM TO CLEAN OUT LI
    NES OF DATA USING SCREEN EDITOR
2ØØ4Ø PRINT"{CLR}{2 DOWN}"
2ØØ5Ø S= 1ØØØ
2Ø1ØØ FORX=STOS+2:PRINTX:NEXTX
2Ø11Ø PRINT"2ØØ5Ø{2 SPACES}S=";X
2Ø115 PRINT"{HOME}"
2Ø37Ø POKE198,5
2Ø375 FORI=1TO5:POKE631+I,13:NEXT:END
3ØØØØ L=INT(L*1ØØ+.ØØ5)/1ØØ:JS$=STR$(L):J
    S$=MID$(JS$,2)
3ØØ1Ø JL=LEN(JS$):IFJL>2THENIF MID$(JS$,J
    L-2,1)="."GOTO3ØØ4Ø
3ØØ2Ø IFJL>1THENIFMID$(JS$,JL-1,1)="."THE
    NJS$=JS$+"Ø":GOTO3ØØ4Ø
3ØØ3Ø JS$=JS$+".ØØ"
```

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```
30040 IF LEFT$(JS$,1)="."THENJS$="0"+JS$
30050 RETURN
```

Program 2:
Stock Market Analyzer – Atari Version

```
5 DIM AA$(10),BB$(10),CC$(10),DD$(10
  ),EE$(10),FF$(10),GG$(10),HH$(10),
  JS$(10),TT$(10),SO$(10),A$(10),D$(
  6)
7 DIM WH$(10),SS$(10),C$(10)
10 GRAPHICS 0:POKE 752,1:POSITION 9,
   10:PRINT "STOCK MARKET ANALYZER":
   FOR W=1 TO 900:NEXT W
15 OPEN #1,4,0,"K:"
25 DIM S$(500),SL(50),FF(50),P(50),S
   A(50),R$(50),TP(50)
30 PRINT "{CLEAR}":POKE 752,0:T=0:GO
   SUB 500
32 PRINT "{CLEAR}THESE ARE THE STOCK
   S I HAVE IN MEMORY":PRINT
35 X1=2:Y1=2:FOR X=1 TO Y
40 POSITION X1,Y1:PRINT S$(X*10+1,X*
   10+SL(X))
42 IF X=7 OR X=14 THEN X1=X1+10:Y1=1
45 Y1=Y1+1:NEXT X:Q=0
50 C=0:T=0
60 F=1022
95 POSITION 2,11:PRINT "CHOICES AVAI
   LABLE  [REV]":PRINT
96 PRINT "SEARCH STOCK{8 SPACES}1"
97 PRINT "STOCKS AT A DATE
   {4 SPACES}2"
98 PRINT "MONTHLY STK PRICES  3"
99 PRINT "BUY OR SELL ADVICE  4"
100 PRINT "STORE BUYS/SALES
    {4 SPACES}5"
101 PRINT "GRAPH A STOCK{7 SPACES}6"
102 PRINT "TRADES IN ANY YEAR  7"
105 GET #1,A:Q=A-48
106 ON Q GOTO 110,200,300,400,700,92
    0,650
107 GOTO 30
110 ? "WHICH STOCK";:INPUT A$
111 RESTORE
112 GOSUB 900
120 FOR X=1 TO 1000
130 READ AA$,BB$,CC$,TT$:DD=VAL(TT$)
    :READ TT$:EE=VAL(TT$):READ TT$:F
    F=VAL(TT$):READ TT$:GG=VAL(TT$)
140 IF A$=AA$ THEN GOSUB 800
150 IF AA$="XXXX" THEN X=1000:NEXT X
    :GOTO 160
155 NEXT X:GOTO 160
160 PRINT :PRINT "{5 SPACES}HIT ANY
    KEY "
170 GET #1,A
180 GOTO 30
200 PRINT
205 RESTORE
210 PRINT "STOCKS DATE YRMM":INPUT D
    $
215 IF LEN(D$)<>4 THEN 210
216 D=VAL(D$):GOSUB 900
220 FOR X=1 TO 1000
221 READ AA$,BB$,CC$,TT$:DD=VAL(TT$)
    :READ TT$:EE=VAL(TT$):READ TT$:F
    F=VAL(TT$):READ TT$:GG=VAL(TT$)
222 BB=VAL(BB$)
223 IF BB=D THEN GOSUB 800
226 IF AA$="XXXX" THEN X=1000:NEXT X
    :GOTO 240
228 NEXT X
240 PRINT "TOTAL IS ";T:PRINT "
    {5 SPACES}HIT ANY KEY"
241 GET #1,A
242 GOTO 30
300 PRINT "{CLEAR}{2 DOWN}TO CALCULA
    TE TODAY'S VALUES AND":PRINT "CR
    EATE DATA STATEMENTS I NEED"
306 GOSUB 500
307 PRINT "TODAY'S DATE (YRMM)";:INP
    UT G
308 PRINT "YOU HAVE ";Y;" STOCKS-"
309 PRINT "FROM STOCK# TO STOCK#":IN
    PUT T,U
310 FOR X=T TO U
312 PRINT "PRICE OF  ";S$(X*10+1,X*1
    0+SL(X))
315 INPUT ZZ:P(X)=ZZ
320 NEXT X:PRINT "{CLEAR}{4 DOWN}"
325 FOR X=T TO U
335 PRINT F;"DATA";S$(X*10+1,X*10+SL
    (X));",";G;",H,0,0,";FF(X);",";P
    (X)
338 F=F+1
339 PRINT
340 NEXT X
345 PRINT "60 F=";F:PRINT "RUN"
350 PRINT "HIT Y TO INPUT DATA"
351 GET #1,A
355 IF A=ASC("Y") THEN POSITION 2,0:
    END
356 GOTO 300
400 PRINT "{CLEAR}{3 DOWN}THE PATTER
    N FOR RECOMMENDING SALES IS BASE
    D ON INCREASING AND DECREASING"
401 PRINT "PRICES.{DOWN}"
405 PRINT "TODAYS PRICES ARE"
410 FOR X=1 TO Y
411 PRINT :? :?
412 PRINT S$(X*10+1,X*10+SL(X));:PRI
    NT "  TODAYS PRICE=":INPUT ZZ:P(
    X)=ZZ
415 NEXT X
420 FOR X=1 TO Y
425 GOSUB 850
440 PRINT S$(X*10+1,X*10+SL(X));"  "
    ;R$(X,X);"{3 SPACES}";MR;"
    {4 SPACES}"
445 IF R$(X,X)="H" THEN PRINT "{UP}
    {15 RIGHT}NO TRADE RECOMMENDED"
450 NEXT X
480 PRINT "DONE":PRINT :PRINT "HIT A
    NY KEY TO CONTINUE"
485 GET #1,A
499 GOTO 30
500 S$(11)="AGOL":SL(1)=4:FF(1)=600:
    SA(1)=3375
501 S$(21)="TRVMF":SL(2)=5:FF(2)=200
    :SA(2)=726.6
503 S$(31)="EAL":SL(3)=3:FF(3)=0:SA(
    3)=0
504 S$(41)="SEAG":SL(4)=4:FF(4)=100:
    SA(4)=9280
505 S$(51)="CASH":SL(5)=4:FF(5)=1:SA
    (5)=55
506 S$(61)="FLYT":SL(6)=4:FF(6)=100:
    SA(6)=3020
507 S$(71)="SMKV":SL(7)=4:FF(7)=1000
    :SA(7)=5220
549 Y=7
```

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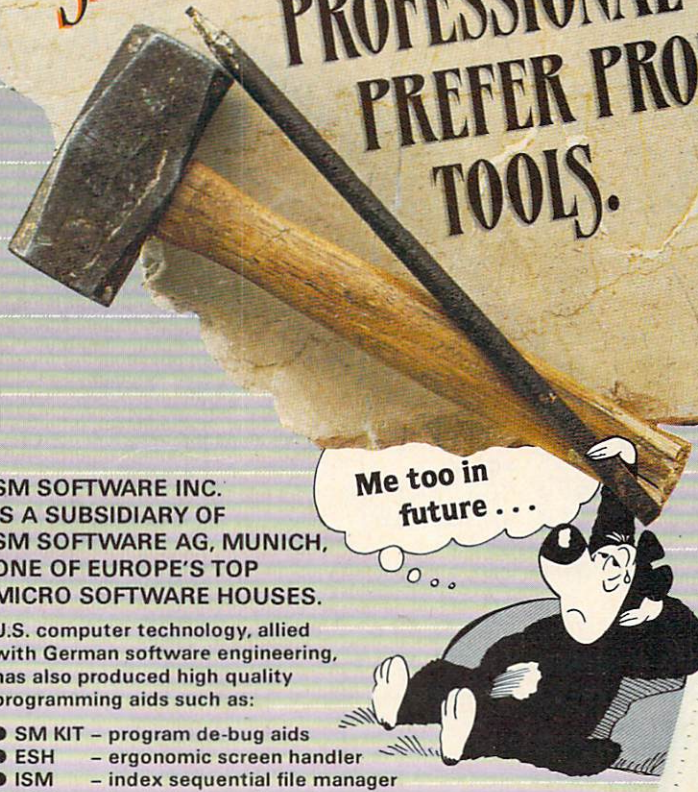

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```
550 RETURN
601 POSITION 2,17
610 FOR S=1 TO X:PRINT "{2 RIGHT}";:
    NEXT S
615 IF HI=0 THEN GOTO 640
620 FOR T=1 TO INT(15/HI)*TP(X):PRIN
    T "{UP}";:NEXT T
625 IF S>20 THEN PRINT "{UP}";:GOTO
    20040
630 PRINT "*";
635 POSITION 2,1
640 RETURN
650 RESTORE
652 PRINT "YEAR OF PORTFOLIO-YR";:IN
    PUT D
654 IF D=0 THEN 210
656 GOSUB 900
658 FOR X=1 TO 1000
660 READ AA$,BB$,CC$,TT$:DD=VAL(TT$)
    :READ TT$:EE=VAL(TT$):READ TT$:F
    F=VAL(TT$):READ TT$:GG=VAL(TT$):
    BB=VAL(BB$)
662 IF D=INT(BB/10000) THEN GOSUB 80
    0
664 IF AA$="XXXX" THEN GOTO 680
668 NEXT X
670 GOTO 780
675 C=0:GET #1,A:D$=CHR$(A)
676 GOTO 668
680 ? "{4 SPACES}HIT ANY KEY "
681 GET #1,A
685 GOTO 30
700 PRINT "{CLEAR}{3 DOWN}STORING NE
    W TRANSACTIONS"
710 PRINT "THERE ARE SEVERAL LINE ST
    ATEMENTS THAT MUST BE CHANGED"
725 PRINT "TODAYS DATE-YYMMDD":INPUT
     DA
728 PRINT "WHICH STOCK":INPUT SO$
730 PRINT "BUY(B)  OR SELL(S)":INPUT
     SS$
735 PRINT "HOW MANY SHARES":INPUT SH
737 PRINT "PRICE PER SHARE ";:INPUT
    P
741 FOR X=1 TO Y:IF SO$=S$(X*10+1,X*
    10+SL(X)) THEN TE=X:X=Y:NEXT X:G
    OTO 745
742 NEXT X
745 ? "NET COST OR PROCEEDS";:INPUT
    NP
747 IF SS$="B" THEN NW=SA(TE)+NP:NF=
    FF(TE)+SH:GOTO 750
748 NW=SA(TE)-NP:NF=FF(TE)-SH
750 PRINT "FF(X) BETWEEN 500-600 IS
    ";NF
752 PRINT "SA(X) SHOULD BE ";NW
755 PRINT "IT SHOULD BE ABOUT ";TE-1
    ;" DOWN"
760 PRINT F;" DATA ";SO$;",";DA;",";
    SS$;",";SH;",";NP;",";NF;",";P
768 PRINT "60 F=";F+1
770 PRINT "RUN"
775 PRINT "HIT ANY KEY BUT N TO ENTE
    R DATA"
780 GET #1,A
782 IF A=ASC("N") THEN 700
783 END
800 REM ROUNDING
801 DD$=STR$(DD):FF$=STR$(FF):IF LEN
    (DD$)=1 THEN DD$(2)="  "
802 L=EE:GOSUB 30000:EE$=JS$:IF LEN(
    FF$)=2 THEN FF$(LEN(FF$)+1)=" "
803 IF LEN(DD$)=2 THEN DD$(3)=" "
804 L=GG:GOSUB 30000:GG$=JS$:IF LEN(
    FF$)=2 THEN FF$(3)="  "
805 L=INT(FF*GG):GOSUB 30000:HH$=JS$
808 PRINT "STOCK  ";AA$:PRINT "DATE
    {3 SPACES}";BB$:PRINT "BUY/SELL
    ";CC$:PRINT "NUM{3 SPACES}";DD$
809 PRINT "$NET{3 SPACES}";EE$:PRINT
     "CUR#  ";FF$:PRINT "MARKET ";GG
    $:PRINT "VALUE  ";HH$
810 PRINT "HIT ANY KEY TO CONTINUE"
811 GET #1,A
812 PRINT "{CLEAR}"
815 T=T+FF*GG
820 RETURN
850 MP=FF(X)*P(X):R$(X,X)="H":MR=0
855 IF MP>SA(X)*1.1 THEN R$(X,X)="S"
    :MP=MP-MP*0.1:MR=MP-SA(X)
856 IF MP<SA(X)*0.9 THEN R$(X,X)="B"
    :MP=MP+MP*0.1:MR=SA(X)-MP
858 IF (MR<300) AND (MR>-300) THEN R
    $(X,X)="H"
865 RETURN
900 PRINT "{CLEAR}"
901 RETURN
920 ? "WHICH STOCK";:INPUT WH$:V=0:R
    ESTORE
925 FOR X=1 TO 1000
930 READ A$,BB$,C$,TT$:D=VAL(TT$):RE
    AD TT$:E=VAL(TT$):READ TT$:F=VAL
    (TT$):READ TT$:G=VAL(TT$):B=VAL(
    BB$)
932 IF B>10000 THEN 940
935 IF WH$=A$ THEN V=V+1:TP(V)=G
936 IF A$="XXXX" THEN GOTO 945
940 NEXT X
945 REM -CREATE GRAPH
946 I=1:HI=0:LP=10
950 FOR X=I TO V
951 IF HI<TP(X) THEN HI=TP(X)
952 IF LP>TP(X) THEN LP=TP(X)
953 NEXT X
960 PRINT "{CLEAR}{3 DOWN}"
962 FOR X=1 TO 13:PRINT CHR$(1):NEXT
     X
964 FOR X=1 TO 38:PRINT CHR$(24);:NE
    XT X
970 FOR X=1 TO V
975 GOSUB 601
980 NEXT X
981 POSITION 2,0:? " HIGH ";HI;"
    {6 SPACES}LOW ";LP
982 PRINT "{3 RIGHT}STOCK IS ";WH$
983 PRINT "{15 DOWN}":FOR X=1 TO V:P
    RINT TP(X);" ";:NEXT X
985 POSITION 14,22:PRINT "HIT ANY KE
    Y"
990 GET #1,A
995 GOTO 30
1000 DATA AGOL,8301,H,0,0,600,5.5
1001 DATA TRVMF,8301,H,0,0,200,4
1002 DATA EAL,8301,H,0,0,0,6.5
1003 DATA SEAG,8301,H,0,0,100,95
1004 DATA CASH,8301,H,0,0,1,55
1005 DATA FLYT,8301,H,0,0,100,35
1006 DATA SMKV,8301,H,0,0,1000,5.5
1007 DATA AGOL,8302,H,0,0,600,6
1008 DATA TRVMF,8302,H,0,0,200,5
1009 DATA EAL,8302,H,0,0,0,7
1010 DATA SEAG,8302,H,0,0,100,100
1011 DATA CASH,8302,H,0,0,1,58
1012 DATA FLYT,8302,H,0,0,100,39
```

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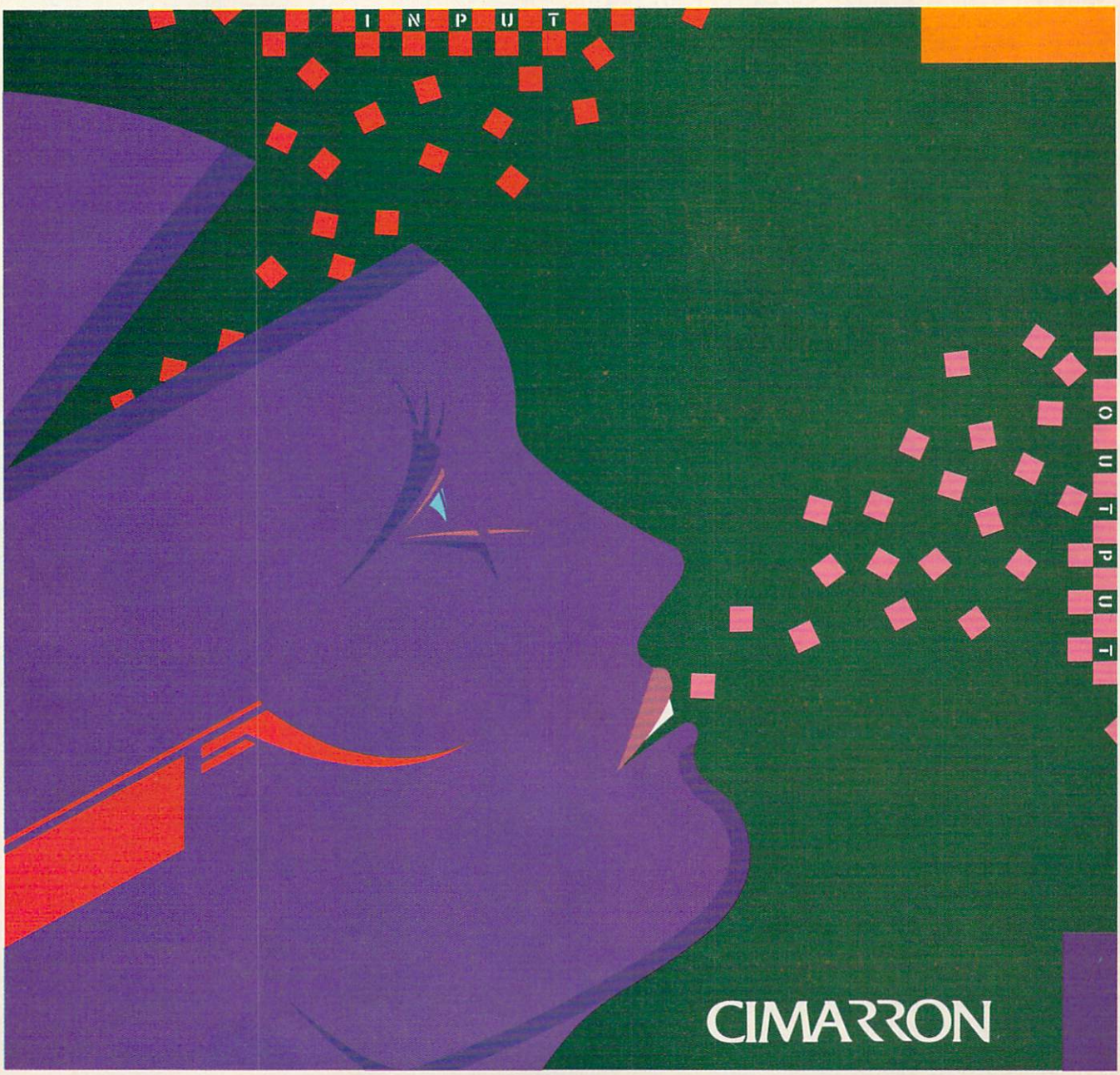

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```
1013 DATA SMKV,8302,H,0,0,1000,6
1014 DATA AGOL,8303,H,0,0,600,4.5
1015 DATA TRVMF,8303,H,0,0,200,6
1016 DATA EAL,8303,H,0,0,0,4
1017 DATA SEAG,8303,H,0,0,100,85
1018 DATA CASH,8303,H,0,0,1,43
1019 DATA FLYT,8303,H,0,0,100,37
1020 DATA SMKV,8303,H,0,0,1000,7
1021 DATA AGOL,830403,B,100,775,600,
     7.5
20000 DATA XXXX,0,X,0,0,0,0,0
20030 REM A SHORT PROGRAM TO CLEAN O
     UT LINES OF DATA USING SCREEN
     EDITOR
20040 PRINT "{CLEAR}{3 DOWN}"
20050 S=1000
20100 ? "{CLEAR}{3 DOWN}";:FOR X=S T
     O S+2:PRINT X:NEXT X
20115 PRINT "20050 S=";X:? "POKE842,
     12":POSITION 2,0
20370 POKE 842,13
20375 END
30000 L=INT(L*100+5.0E-03)/100:JS$=S
     TR$(L)
30010 JL=LEN(JS$):IF JL>2 THEN IF JS
     $(JL-2,JL-2)="." THEN 30040
30020 IF JL>1 THEN IF JS$(JL-1,JL-1)
     "." THEN JS$(LEN(JS$)+1)="0":
     GOTO 30040
30030 JS$(LEN(JS$)+1)=".00"
30040 IF JS$(1,1)="." THEN TT$="0":T
     T$(2)=JS$:JS$=TT$
30070 RETURN                    ©
```

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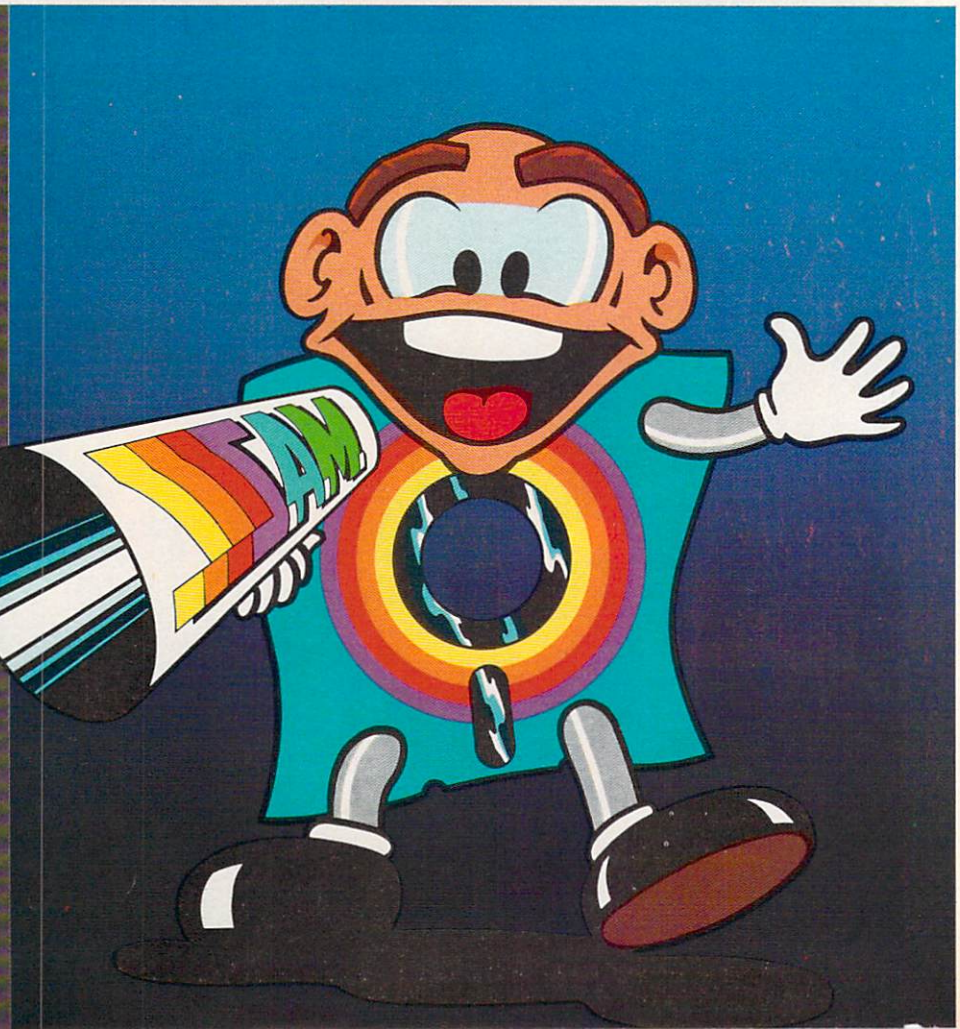

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Norman Overpeck

As you wend your way through the cemetery on a black and tempestuous night, beware of the tombstones. If you run into one, lightning will strike – and it only strikes once. The game includes five difficulty levels. Written for the unexpanded VIC, Atari and 64 versions are also included.

It's a dark, stormy night with howling winds and bolts of lightning. You've got to get home – but first you must cross through the cemetery.

Since you don't believe in ghosts, you won't have to worry about them. But the graveyard is very old and there are lots of tombstones. You have to hurry, but you can't bump into a grave marker – if you do, you'll be struck by lightning and it's goodbye, Charlie.

How To Play

"Goodbye Charlie" was originally written for the unexpanded VIC. The Atari and 64 versions include instructions within the programs.

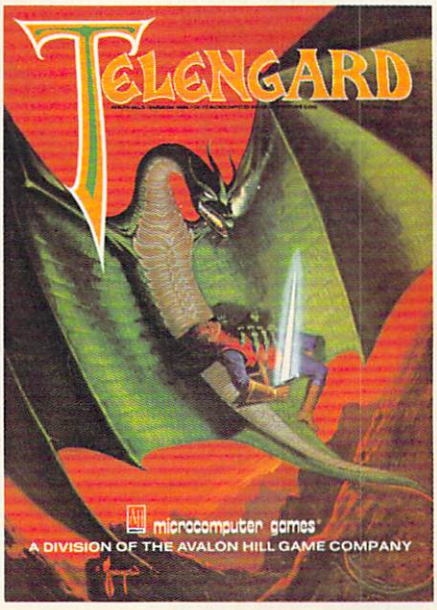
In the VIC version, four keys (Q, A, S, Z) are used to control movement. The L key is used to light up the screen when you need to peek at the graveyard.

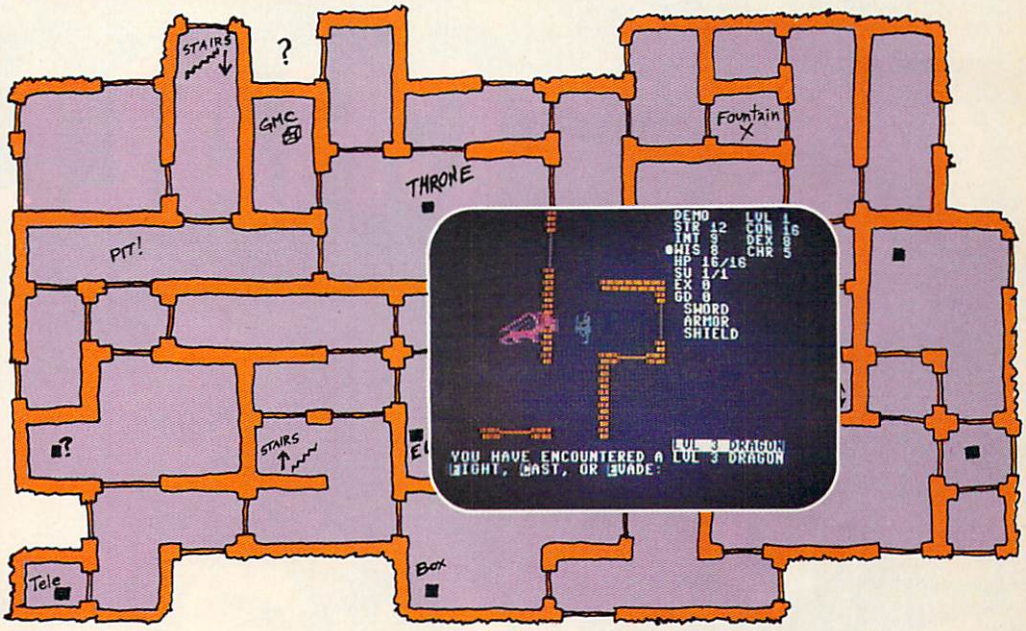
Success in this game depends on memory and perception. At the start, the computer will randomly place the tombstones and briefly light up the screen so you can see the obstacles. Get a good look. The first look is free, but any after that will cost you points.

You will have to move across a dark screen relying only on your memory of the tombstones' locations. Remember – if you lose your nerve, you can get additional glimpses of the cemetery by pressing L, but this will subtract points from your score.

Goodbye Charlie has five difficulty levels. After typing in and saving the program, try the

Be Amazed!





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That's the number of levels in the TELENGARD dungeon.

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NUKEWAR: Defend your country by massive espionage efforts, or by building jet fighter bombers, missiles, submarines and ABM's. Your cold and calculating computer will choose its own strategy! Cassette for Commodore 64, VIC-20 (16K), TRS-80 Mods. I/III (16K) and Atari Home Computers just $16.00.

FOOTBALL STRATEGY: Animated action on a scrolling field. A head-to-head challenge or solitaire as you select the best offensive or defensive plays in response to your opponent. Commodore 64, Atari Home Computers (32K) and TRS-80 Models I/III/IV (16K) cassette for $16.00. Atari (32K), IBM (64K) and TRS-80 Models I/III/IV (32K) diskettes available at $21.00.

T.G.I.F.: Thank Goodness It's Friday! Avalon Hill's new party game for one to four players recreating an often-not-so-typical week in the lives of the working class. Half the fun is just making it from Monday to Sunday. Commodore 64, Atari Home Computers (40K) cassette for a meager $20.00. Atari diskette (48K) for $25.00.

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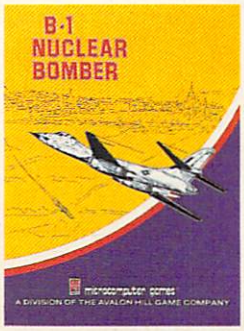

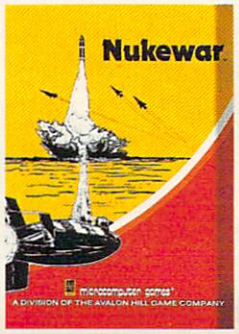

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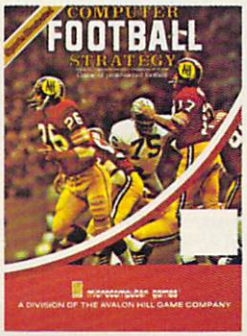
QUALITY



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In Miner 2049er,™ you helped the legendary mounty, Bounty Bob,™ track the villainous Yukon Yohan™ through an abandoned uranium mine — all ten levels of it — grabbing buried treasure and avoiding deadly radioactive mutants along the way.

Well, that was only the beginning!

Yukon Yohan has escaped to the city and Bounty Bob is after him! Only this time, Bob's run out of bucks, so he's taken a job as a fireman to fund the chase. And guess which villain has torched a skyscraper to trap Bounty Bob?

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Scraper Caper™ has all the action, adventure and excitement that can be packed into a ROM cartridge. And it features a mind boggling number of rounds, difficulty adjustment, high score table, demo mode and spectacular sound and graphic effects.

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HOTTEST
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SCRAPER
CAPER
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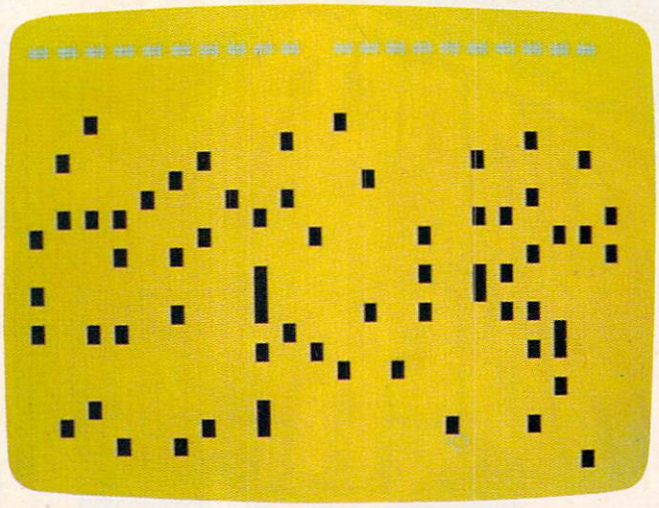
2049

first level so you can acquaint yourself with the game.



You get a brief look at the graveyard before continuing your night stalk in the VIC version of "Goodbye Charlie"

Program 1: Goodbye Charlie – VIC Version

```
5 CL=30720
6 PRINT"{CLR}"
7 PRINTTAB(2)"{2 DOWN} GOODBYE CHARLIE"
10 FORA=7680TO7701:POKEA,43:POKEA+CL,6:NE
   XT
15 FORA=7701TO8185STEP22 :POKEA,43:POKEA+
   CL,6:NEXT
25 FORA=8185TO8164STEP-1:POKEA,43:POKEA+C
   L,6:NEXT
30 FORA=8164TO7680STEP-22:POKEA,43:POKEA+
   CL,6:NEXT
32 FORI=1TO2800:NEXT
35 PRINT"{BLU}{CLR}{2 DOWN}IT IS A DARK,C
   OLD AND":PRINTSPC(4)"RAINY NIGHT
36 PRINT"{DOWN}AND YOU HAVE CHOSEN":PRINT
   SPC(1)"TO CROSS A GRAVEYARD"
37 PRINTSPC(5)"TO REACH HOME"
38 PRINT"{DOWN}{RIGHT}THERE IS A VIOLENT
   {4 SPACES}STORM AND THE GRAVE"
39 PRINTTAB(2)"YARD IS MOMENTARILY
   {3 SPACES}LIT UP ";
40 PRINT"BY LIGHTNING
42 PRINTTAB(2)"{DOWN}IF YOU BUMP INTO A
   {2 SPACES}TOMBSTONE YOU WILL BE HIT BY
   THE LIGHTNING"
44 PRINT"{3 DOWN}{3 SPACES}DIRECTIONS? Y/
   N"
45 GETA$:IFA$=""THEN45
46 IFA$="N"THEN89
48 PRINT"{CLR}{2 DOWN}"
50 PRINTTAB(8)"Q=UP{2 DOWN}"
55 PRINTTAB(2)"A=LEFT{5 SPACES}S=RIGHT"
60 PRINTTAB(8)"{2 DOWN}Z=DOWN"
65 PRINT"{2 DOWN}PRESS L";
70 PRINT"{3 RIGHT}FOR A QUICK":PRINT
72 PRINT"LOOK AT THE GRAVEYARD"
75 PRINT"{3 DOWN}EACH LOOK WILL LOWER
   {9 SPACES}YOUR SCORE
80 PRINT"{2 DOWN}PRESS RETURN TO CONT
85 GETA$:IFA$<>CHR$(13)THEN85
89 PRINT"{CLR}{GRN}"
90 PRINT"{YEL}{CLR}{3 DOWN}LEVEL OF DIFFI
   CULTY":SC=0:C=30720
91 PRINTTAB(6)"{2 DOWN}1 2 3 4 5"
92 GETA$:IFA$<>"1"ANDA$<>"2"ANDA$<>"3"AND
   A$<>"4"ANDA$<>"5"THEN92
93 IFPEEK(197)=0THEN300
94 IFPEEK(197)=56THEN310
95 IFPEEK(197)=1THEN320
96 IFPEEK(197)=57THEN330
97 IFPEEK(197)=2THEN340
98 POKE36879,8:GOSUB200:GOSUB200:PRINT"
   {CLR}":GOTO410
100 PRINT"{CLR}"
105 PRINTTAB(15)"NN"
110 PRINTTAB(13)"NZNN"
115 PRINTTAB(12)"NNMN"
120 PRINTTAB(9)"NZNN"
125 PRINTTAB(8)"NNMN"
130 PRINTTAB(7)"NN"
135 PRINTTAB(6)"NN"
140 PRINTTAB(6)"Z"
145 PRINTTAB(5)"N"
146 PRINT"{CLR}":RETURN
148 PRINT"{CLR}":PRINTTAB(15)"NN"
150 PRINTTAB(13)"NZNN"
152 PRINTTAB(12)"NNMN"
155 PRINTTAB(9)"NZNN"
160 PRINTTAB(9)"NMN"
162 RETURN
165 PRINT"{CLR}": PRINTTAB(15)"NN"
170 PRINTTAB(13)"NZNN"
175 PRINTTAB(13)"NMN"
178 RETURN
180 PRINT"{WHT}"
200 PRINT"{WHT}":FORT=1TO3:GOSUB165:FORR=
    1TO30:NEXTR,T
205 FORT=1TO3:GOSUB148:FORR=1TO30:NEXTR,T
210 FORT=1TO9:GOSUB100:NEXT
222 POKE649,1
225 FORT=1TO9:POKE36879,59:POKE36879,25:P
    OKE36879,8:NEXT
230 POKE36877,220:FORL=15TO0STEP-3:POKE36
    878,L:FORM=1TO275:NEXTM,L
235 POKE36877,0:POKE36878,0:RETURN
300 Z=55:CU=8175:DF=.2:GOTO98
310 Z=80:CU=8179:DF=.25:GOTO98
320 Z=110:CU=8169:DF=.3:GOTO98
330 Z=130:CU=8182:DF=.35:GOTO98
340 Z=160:CU=8165:DF=.4:GOTO98
410 FORK=1TOZ
415 X=INT(RND(1)*440)+7746
420 POKEX,97:POKEX+C,8:NEXT
425 POKECU,15:POKECU+C,1:POKECU-22,32:POK
    ECU+1,32:POKECU-1,32
430 FORT=7680TO7767:POKET,32:NEXT
435 FORT=7680TO7700:POKET,35:POKET+C,1:NE
    XT
440 POKE7690,32
442 GOSUB800:SC=SC+(INT(SC/10))
445 GETA$:IFA$=""THEN445
446 IFPEEK(7690)=15THEN700
447 POKE649,1
450 IFA$="Q"THEN500
455 IFA$="A"THEN520
460 IFA$="S"THEN540
465 IFA$="Z"THEN560
470 IFA$="L"THENGOSUB800
475 GOTO445
500 IFPEEK(CU-22)=97THEN600
505 IFPEEK(CU-22)=35THENCU=CU+22
515 POKECU,32:CU=CU-22:POKECU+CL,1:POKECU
    ,15:S=CS+10:GOTO445
520 IFPEEK(CU)=97THEN600
```

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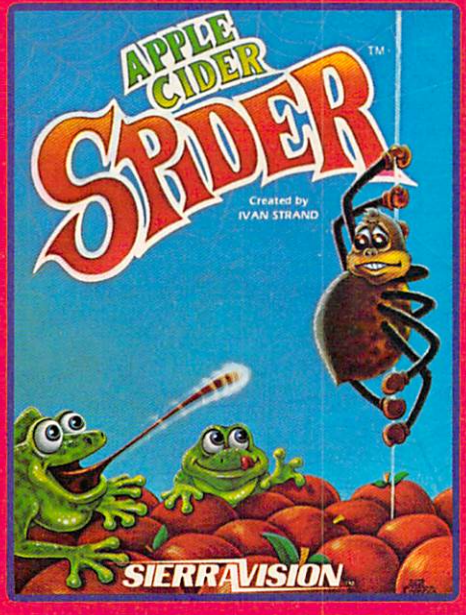

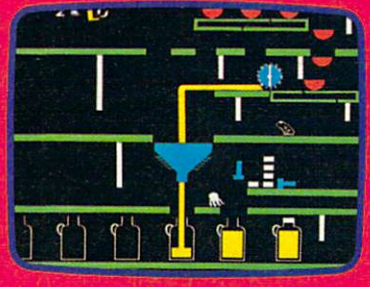

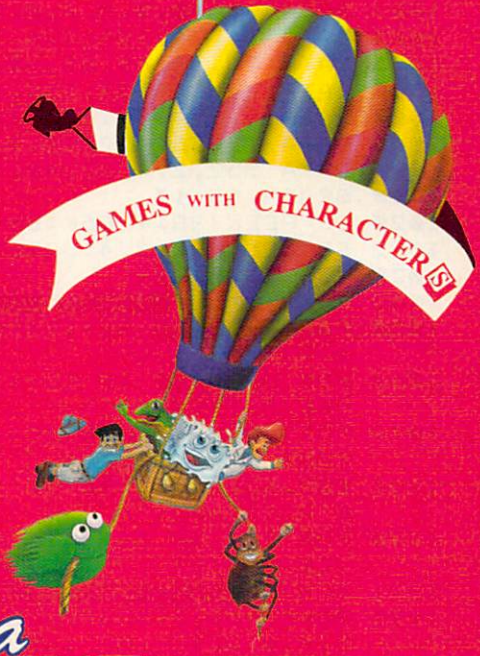

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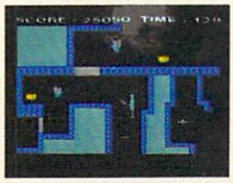
```
525 POKECU,32:CU=CU-1:POKECU+CL,1:POKECU,
    15:SC=SC+10:GOTO445
540 IFPEEK(CU)=97THEN600
545 POKECU,32:CU=CU+1:POKECU+CL,1:POKECU,
    15:SC=SC+10:GOTO445
560 IFPEEK(CU)=97THEN600
565 POKECU,32:CU=CU+22:POKECU+CL,1:POKECU
    ,15:SC=SC-10:GOTO445
600 PRINT"{CLR}{2 DOWN}{BLU}"
605 PRINTTAB(7)"{4 DOWN}R.I.P.
610 GOSUB230
615 PRINTTAB(2)"{PUR}{8 DOWN}TOO BAD CHAR
    LIE!!"
620 FORT=1TO2500:NEXT:PRINT"{2 DOWN}
    {2 RIGHT}ANOTHER GAME? Y/N"
625 GETA$:IFA$=""THEN625
628 IFA$<>"Y"ANDA$<>"N"THEN625
630 IFA$="Y"THEN90
640 PRINT"{CLR}"
645 PRINTTAB(3)"{3 DOWN}GOODBYE CHARLIE"
650 END
700 PRINT"{CLR}{2 DOWN}SCORE=";INT(SC*DF)
    *10
710 POKE36879,140:PRINT"{7 DOWN}{2 RIGHT}
    YOU MADE IT HOME
720 PRINT:PRINT"{3 RIGHT}SAFE CHARLIE!
730 FORT=1TO2500:NEXT:PRINT"{4 DOWN}NEW G
    AME? Y/N"
735 GETA$:IFA$=""THEN735
740 IFA$="Y"THEN90
745 GOTO640
800 SC=SC-(INT(SC/10))
805 FORT=1TO4:POKE36879,127:FORD=1TO70:NE
    XTD:POKE36879,8:NEXT:GOSUB225:RETURN
```

Program 2: Goodbye Charlie – Atari Version

```
1001 GRAPHICS 0:SETCOLOR 2,0,0:SETCO
     LOR 1,0,0:CH=PEEK(742)*256-1024
1002 FOR I=0 TO 55:READ A:POKE CH+I,
     A:NEXT I
1003 DATA 0,0,0,0,0,0,0,0
1004 DATA 24,24,126,126,24,24,24,24
1005 DATA 28,34,65,65,65,34,28,0
1006 DATA 34,255,34,255,34,255,34,34
1007 DATA 1,2,4,8,16,32,64,128
1008 DATA 128,64,32,16,8,4,2,1
1009 DATA 252,2,3,12,48,192,64,63
1010 GRAPHICS 17
1020 SC=PEEK(88)+PEEK(89)*256
1022 SETCOLOR 0,0,4:SETCOLOR 2,3,8
1025 POSITION 2,9
1030 PRINT #6;"GOODBYE  CHARLIE"
1050 FOR A=SC TO SC+19:POKE A,11:NEX
     T A
1060 FOR A=SC+19 TO SC+479 STEP 20:P
     OKE A,11:NEXT A
1070 FOR A=SC+479 TO SC+460 STEP -1:
     POKE A,11:NEXT A
1080 FOR A=SC+460 TO SC STEP -20:POK
     E A,11:NEXT A
1090 FOR I=1 TO 1500:IF STRIG(0)=1 T
     HEN NEXT I
1091 REM DISPLAY INSTRUCTIONS
1095 POKE 752,1:GRAPHICS 0:SETCOLOR
     2,0,0:SETCOLOR 1,0,6
1100 POSITION 2,1:PRINT "It is a dar
     k, cold, and rainy night,"
1110 PRINT "and you have chosen to c
     ross a":PRINT "graveyard to rea
     ch home."
1130 PRINT "{DOWN}There is a violent
      storm and the"
1140 PRINT "graveyard is momentarily
      lit up"
1150 PRINT "by lightning.":PRINT "
     {DOWN}If you bump into a graves
     tone"
1160 PRINT "you will be hit by the l
     ightning."
1170 PRINT "{DOWN}Steer with a joyst
     ick in port #1."
1175 PRINT "Use the firebutton for a
      quick look":PRINT "at the grav
     eyard."
1180 PRINT "{DOWN}Each look will low
     er your score."
1190 PRINT "{2 DOWN}{5 SPACES}DEGREE
      OF DIFFICULTY":SCORE=0:PRINT "
     {10 SPACES}1 2 3 4 5":X=0
1210 POSITION 11+X*2,20:PRINT "
     {RIGHT}";:GOSUB 5000
1212 IF STRIG(0)=0 THEN 1250
1215 A=STICK(0):IF A=15 THEN 1212
1220 IF A=7 THEN X=X+1:IF X>4 THEN X
     =0
1230 IF A=11 THEN X=X-1:IF X<0 THEN
     X=4
1240 GOTO 1210
1250 ON X+1 GOSUB 1430,1440,1450,146
     0,1470:GRAPHICS 17:POKE 756,CH/
     256:GOSUB 1280:GOSUB 1280
1255 PRINT #6;"{CLEAR}":SETCOLOR 4,0
     ,0:SETCOLOR 0,0,0:GOTO 1500
1260 REM FLASH LIGHTNING
1280 FOR T=1 TO 3
1290 PRINT #6;"{CLEAR}":POSITION 13,
     1:PRINT #6;"$$":POSITION 11,2:P
     RINT #6;"$&$$"
1300 POSITION 11,3:PRINT #6;"$%$"
1310 FOR R=1 TO 20:NEXT R:NEXT T
1320 FOR T=1 TO 3
1330 PRINT #6;"{CLEAR}":POSITION 13,
     1:PRINT #6;"$$":POSITION 11,2:P
     RINT #6;"$&$$":POSITION 10,3:PR
     INT #6;"$$%$"
1340 POSITION 7,4:PRINT #6;"$&$$":PO
     SITION 7,5:PRINT #6;"$%$"
1360 FOR R=1 TO 20:NEXT R:NEXT T
1370 FOR T=1 TO 9
1380 PRINT #6;"{CLEAR}":POSITION 13,
     1:PRINT #6;"$$":POSITION 11,2:P
     RINT #6;"$&$$":POSITION 10,3:PR
     INT #6;"$$%$"
1390 PRINT #6;"{7 SPACES}$&$$":PRINT
      #6;"{6 SPACES}$$%$":PRINT #6;"
     {5 SPACES}$$":PRINT #6;"
     {4 SPACES}$$":PRINT #6;"
     {4 SPACES}&"
1395 PRINT #6;"{3 SPACES}$":PRINT #6
     ;"{CLEAR}"
1400 NEXT T
1410 FOR T=1 TO 9:SETCOLOR 4,10,6:SE
     TCOLOR 4,0,6:SETCOLOR 4,0,0:NEX
     T T
1420 FOR L=15 TO 0 STEP -1:SOUND 0,1
     ,8,L:FOR J=1 TO 50:NEXT J:NEXT
     L:RETURN
1430 Z=55:CU=SC+470:DF=0.2:RETURN
1440 Z=80:CU=SC+474:DF=0.25:RETURN
1450 Z=110:CU=SC+464:DF=0.3:RETURN
1460 Z=130:CU=SC+477:DF=0.35:RETURN
```

WELCOME TO APSHAI. YOU'RE JUST IN TIME FOR LUNCH.



Boy, have you taken a wrong turn. One moment you're gathering treasure and the next you're being eyed like a side of beef.

You're in the Gateway to Apshai.™ The new cartridge version of the Computer Game of the Year,* Temple of Apshai.™

Gateway has eight levels. And over 400 dark, nasty chambers to explore. And because it's joystick controlled, you'll have to move faster than ever.

But first you'll have to consider your strategy. Is it treasure you're after? Or glory? You'll live longer if you're greedy, but slaying monsters racks up a higher score.

The Apshai series is the standard by which all other adventure games are judged. And novices will not survive.

They'll be eaten.

One player; Temple of Apshai, disk/cassette; Gateway to Apshai, cartridge, joystick control.

EPYX COMPUTER SOFTWARE

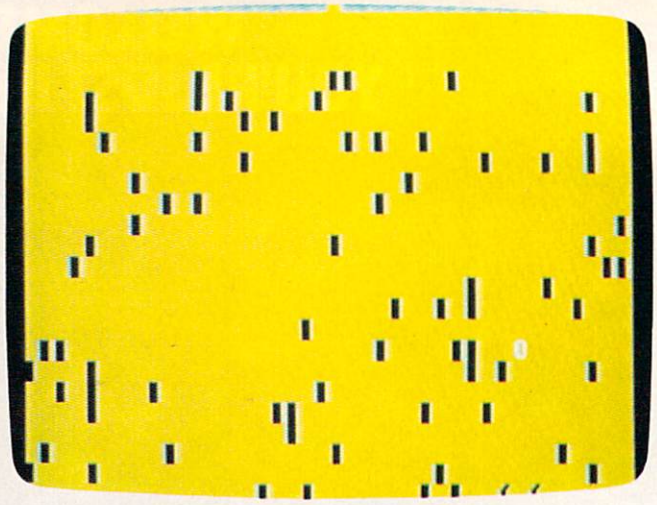
STRATEGY GAMES FOR THE ACTION-GAME PLAYER.

*Game Manufacturers Association, 1981

```
1470 Z=160:CU=SC+460:DF=0.4:RETURN
1490 REM SCREEN SETUP
1500 FOR K=1 TO Z
1510 X=SC+INT(RND(1)*400)+60
1520 POKE X,1:NEXT K
1530 POKE CU-20,0:POKE CU+1,0:POKE C
     U-1,0
1540 FOR T=SC TO SC+19:POKE T,131:NE
     XT T:FOR T=SC+20 TO SC+79:POKE
     SC,0:NEXT T:POKE SC+10,0
1550 POKE CU,66:GOSUB 4000:SCORE=SCO
     RE+INT(SCORE/10)
1555 REM PROGRAM MAIN LOOP BEGINS
1560 POKE CU,66:GOSUB 5000:IF CU=SC+
     10 THEN 2500
1565 IF STRIG(0)=0 THEN GOSUB 4000
1570 A=STICK(0):IF A=15 THEN 1565
1580 DR=20:IF A=14 THEN DR=-20
1590 IF A=7 THEN DR=1
1600 IF A=11 THEN DR=-1
1610 POKE CU,0:CU=CU+DR:IF PEEK(CU)=
     1 THEN 2000
1620 IF PEEK(CU)=3 THEN CU=CU-DR:GOT
     O 1560
1630 SCORE=SCORE+10:GOTO 1560
1990 REM LIGHTNING STRIKES CHARLIE
2000 POKE 756,224:PRINT #6;"{CLEAR}"
     :SETCOLOR 0,0,6:POSITION 7,7:PR
     INT #6;"R.I.P":GOSUB 1420
2010 POSITION 1,16:PRINT #6;"TOO BAD
     , CHARLIE!!"
2020 FOR T=1 TO 500:NEXT T:POSITION
     5,18:PRINT #6;"PRESS FIRE":PRIN
     T #6;"{4 SPACES}TO PLAY AGAIN";
2030 FOR I=0 TO 1500:IF STRIG(0)=1 T
     HEN NEXT I:PRINT "{CLEAR}
     {2 DOWN}GOODBYE CHARLIE!":END
2040 GOTO 1095
2490 REM THROUGH THE GATE
2500 POKE 756,224:PRINT #6;"{CLEAR}"
     :SETCOLOR 0,2,6:POSITION 0,2:PR
     INT #6;"{4 SPACES}SCORE = ";INT
     (SCORE*DF)*10
2510 POSITION 2,10:PRINT #6;"YOU MAD
     E IT HOME":POSITION 3,12:PRINT
     #6;"SAFE, CHARLIE!":GOTO 2020
3990 REM FLASH THE LIGHTNING
4000 SCORE=SCORE-INT(SCORE/10)
4010 FOR T=1 TO 4:SETCOLOR 0,14,6:FO
     R D=1 TO 40:NEXT D:SETCOLOR 0,0
     ,0:NEXT T:GOSUB 1410:RETURN
5000 FOR DD=1 TO 40:NEXT DD:RETURN
```

Program 3: Goodbye Charlie – 64 Version

```
1 POKE 53281,12:POKE53280,13
5 CL=54272
6 PRINT"{CLR}"
7 PRINT TAB(10)"{10 DOWN}{BLK} GOODBYE CH
  ARLIE"
10 FORA=1024TO1063:POKEA,43:POKEA+CL,1:NE
   XT
15 FORA=1063TO2023STEP40 :POKEA,43:POKEA+
   CL,1:NEXT
25 FORA=2023TO1984STEP-1:POKEA,43:POKEA+C
   L,1:NEXT
30 FORA=1984TO1024STEP-40:POKEA,43:POKEA+
   CL,1:NEXT
32 FORI=1TO2800:NEXT
34 POKE 53281,0:POKE53280,0
35 PRINT"{CYN}{CLR}{2 DOWN}{3 SPACES}IT I
   S A DARK,COLD AND RAINY NIGHT.
36 PRINT"{3 SPACES}{DOWN}YOU HAVE CHOSEN
   {SPACE}TO CROSS A GRAVEYARD {DOWN}";
37 PRINT"TO REACH HOME, BUT";
38 PRINT"{RIGHT}THERE IS A VIOLENT{DOWN}"
   :PRINT"STORM AND THE GRAVE";
39 PRINTTAB(2)"YARD IS MOMENTARILY{DOWN}
   {3 SPACES}LIT UP ";
40 PRINT"BY LIGHTNING.
42 PRINT"{4 SPACES}{DOWN}IF YOU BUMP INTO
    A{2 SPACES}GRAVESTONE YOU{DOWN}
   {2 SPACES}WILL BE HIT BY THE LIGHTNING
   "
44 PRINT"{3 DOWN}{5}{12 SPACES}DIRECTIO
   NS? Y/N"
45 GETA$:IFA$=""THEN45
46 IFA$="N"THEN90
48 PRINT"{CLR}{2 DOWN}"
50 PRINT"{2 DOWN}{5}{4 SPACES}STEER WIT
   H JOYSTICK IN PORT 2.
65 PRINT"{3 DOWN}{4 SPACES}YOU CAN PRESS
   {SPACE}THE {WHT}FIRE BUTTON{5}";
70 PRINT"{RIGHT}FOR{7 SPACES}{DOWN}A QUIC
   K";
72 PRINT" LOOK AT THE GRAVEYARD, BUT"
75 PRINT"{DOWN}{4 SPACES}EACH LOOK WILL L
   OWER YOUR SCORE.
80 PRINT"{2 DOWN}{WHT}{6 SPACES}PRESS
   {RVS}RETURN{OFF} TO CONTINUE
85 GETA$:IFA$<>CHR$(13)THEN85
90 PRINT"{WHT}{CLR}{3 DOWN}{8 SPACES}DEGR
   EE OF DIFFICULTY?":SC=0:C=30720
91 PRINTTAB(12)"{2 DOWN}{YEL}1 {PUR}2
   {6}3 {7}4 {CYN}5"
92 GETA$:IFA$<"1"ORA$>"5"THEN92
93 IF A$="1"THENZ=55:CU=2012:DF=.2
94 IF A$="2"THENZ=80:CU=2016:DF=.25
95 IF A$="3"THENZ=110:CU=2006:DF=.3
96 IF A$="4"THENZ=130:CU=2019:DF=.35
97 IF A$="5"THENZ=160:CU=2002:DF=.4
98 GOSUB200:GOSUB5000:GOSUB200:GOSUB5000:
   PRINT"{CLR}":GOTO410
100 PRINT"{CLR}"
105 PRINTTAB(25)"NN"
110 PRINTTAB(23)"NZNN"
115 PRINTTAB(22)"NNMN"
120 PRINTTAB(19)"NZNN"
125 PRINTTAB(18)"NNMN"
130 PRINTTAB(17)"NN"
```



64 version of "Goodbye Charlie!"

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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?

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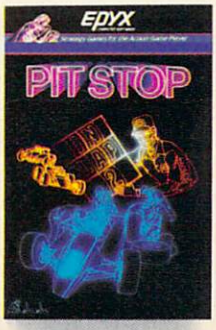

EPYX COMPUTER SOFTWARE

STRATEGY GAMES FOR THE ACTION-GAME PLAYER.

See your retailer for available computer formats.

```
135 PRINTTAB(16)"NN"
140 PRINTTAB(16)"Z"
145 PRINTTAB(15)"N"
146 PRINT"{CLR}":RETURN
148 PRINT"{CLR}":PRINTTAB(25)"NN"
150 PRINTTAB(23)"NZNN"
152 PRINTTAB(22)"NNMN"
155 PRINTTAB(19)"NZNN"
160 PRINTTAB(19)"NMN"
162 RETURN
165 PRINT"{CLR}": PRINTTAB(25)"NN"
170 PRINTTAB(23)"NZNN"
175 PRINTTAB(23)"NMN"
178 RETURN
180 PRINT"{WHT}"
200 PRINT"{WHT}":FORT=1TO3:GOSUB165:FORR=
    1TO30:NEXTR,T
205 FORT=1TO3:GOSUB148:FORR=1TO30:NEXTR,T
210 FORT=1TO9:GOSUB100:NEXT
222 POKE649,1
225 FORT=1TO9:POKE53281,3:POKE 53281,1
227 POKE53281,0:NEXT
230 REM MAKE SOME NOISE
235 REM KILL SOME NOISE
238 RETURN
410 FORK=1TOZ
415 X=INT(RND(1)*880)+1144
420 POKEX,97:POKEX+CL,0:NEXT
425 POKECU,15:POKECU+CL,1:POKECU-40,32:PO
    KECU+1,40:POKECU-1,40
430 FORT=1024TO1184:POKET,32:NEXT
435 FORT=1024TO1062:POKET,35:POKET+CL,3:N
    EXT
440 POKE1044,32
442 GOSUB800:SC=SC+(INT(SC/10))
445 IF PEEK(56320)=127 THEN 445
446 IFPEEK(1044)=15THEN700
447 POKE649,1
450 IF (PEEK(56320)AND1)=0 THEN500
455 IF (PEEK(56320)AND4)=0 THEN520
460 IF (PEEK(56320)AND8)=0 THEN540
465 IF (PEEK(56320)AND2)=0 THEN560
470 IF(PEEK(56320)AND16)=0THENGOSUB800
475 GOTO445
500 IFPEEK(CU-40)=97THEN600
505 IFPEEK(CU-40)=35THENCU=CU+40
515 POKECU,32:CU=CU-40:POKECU+CL,1:POKECU
    ,15:S=CS+10:GOTO445
520 IFPEEK(CU-1)=97THEN600
525 POKECU,32:CU=CU-1:POKECU+CL,1:POKECU,
    15:SC=SC+10:GOTO445
540 IFPEEK(CU+1)=97THEN600
545 POKECU,32:CU=CU+1:POKECU+CL,1:POKECU,
    15:SC=SC+10:GOTO445
560 IFPEEK(CU+40)=97THEN600
565 POKECU,32:CU=CU+40:POKECU+CL,1:POKECU
    ,15:SC=SC-10:GOTO445
600 PRINT"{CLR}{2 DOWN}[1]"
605 PRINTTAB(15)"{4 DOWN}R.I.P.
610 GOSUB230
615 PRINTTAB(11)"{PUR}{8 DOWN}TOO BAD CHA
    RLIE!!"
620 FORT=1TO2500:NEXT:PRINT"{2 DOWN}
    {11 RIGHT}ANOTHER GAME? Y/N"
625 GETA$:IFA$=""THEN625
628 IFA$<>"Y"ANDA$<>"N"THEN625
630 IFA$="Y"THEN90
640 PRINT"{CLR}"
645 PRINTTAB(13)"{3 DOWN}GOODBYE CHARLIE"
650 END
700 PRINT"{CLR}{2 DOWN}SCORE=";INT(SC*DF)
    *10
710 POKE53281,12:PRINT"{7 DOWN}{12 RIGHT}
    YOU MADE IT HOME
720 PRINT:PRINT"{13 RIGHT}SAFE CHARLIE!
730 FORT=1TO2500:NEXT:PRINT"{4 DOWN}
    {13 RIGHT}NEW GAME? Y/N"
735 GETA$ :IFA$=""THEN735
740 IFA$="Y"THENPOKE53281,0:GOTO90
745 GOTO640
800 SC=SC-(INT(SC/10))
805 FORT=1TO4:POKE53281,7:FORD=1TO70:NEXT
    D:POKE53281,0:NEXT:GOSUB225:GOTO 5000
5000 S=13*4096+4*256
5010 FORT=STOS+24:POKET,0:NEXT
5020 POKE S+24,15
5030 POKES+5,16*1+10:POKES+6,16*5 +11
5040 POKES+1,80 :POKES,80
5050 POKES+4;129:FORT=1TO300:NEXT:POKES+4
     ,128
5060 RETURN                                    ©
```


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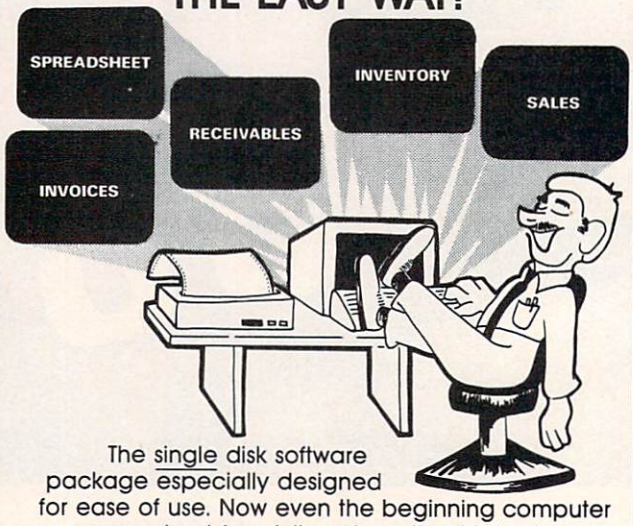

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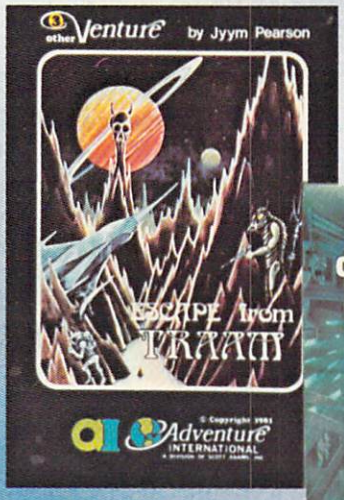

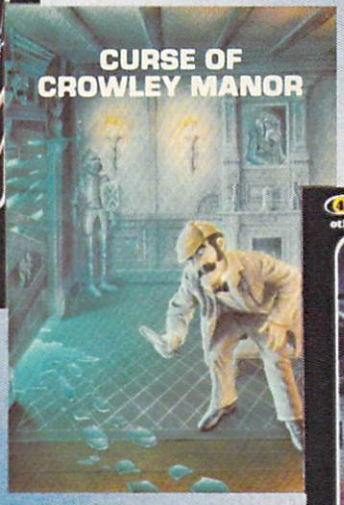

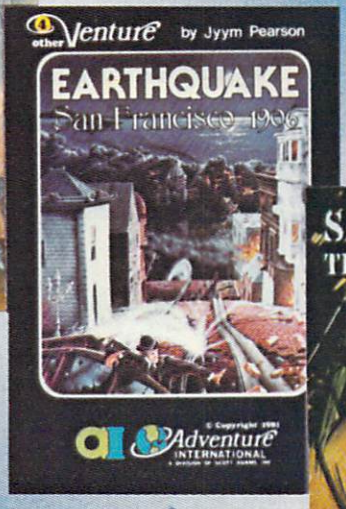

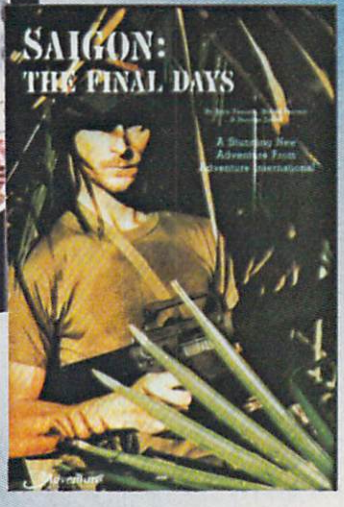

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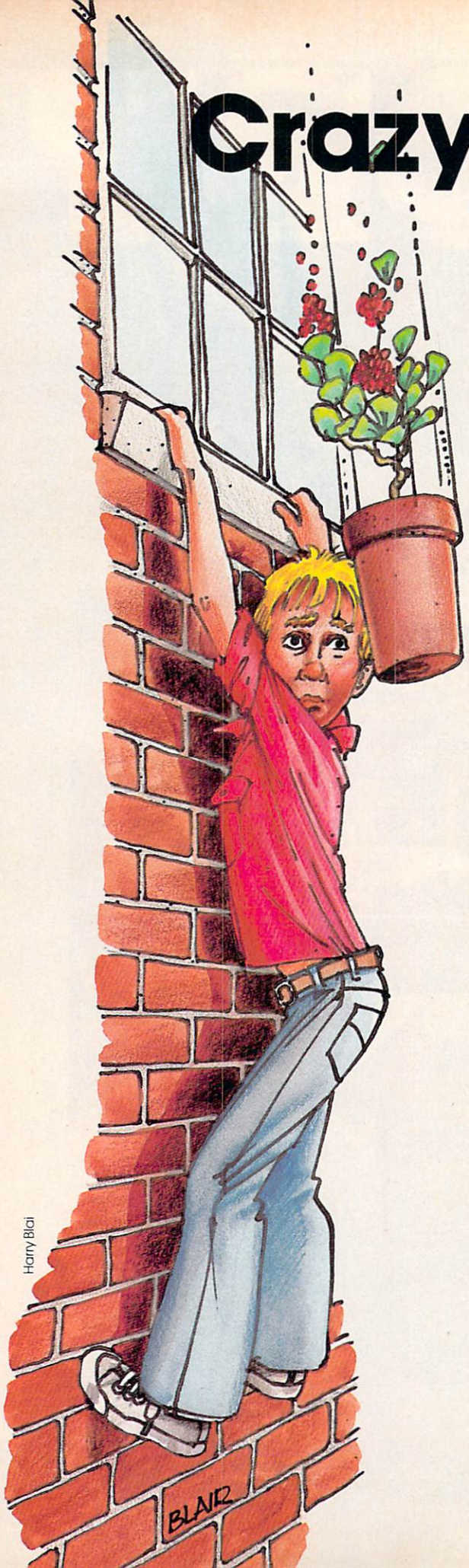
Crazy Climber

Ted Reynolds



Harry Blai

As you scale the side of a building, maneuvering around windows, watch out for the falling flowerpots and attacking birds. Originally written on the VIC with joystick, versions are included for the 64 (with joystick) and the TI-99/4A with Extended BASIC.

"Crazy Climber" is a game requiring manual dexterity and judgment. With a joystick, you control the Crazy Climber as he scales the side of a brick building, avoiding windows and falling objects. The higher he climbs, the higher your score.

The VIC Version

First, type in and save Program 1. Then type in Program 2 and save it immediately following Program 1 on the same tape. When Program 1 is RUN, it will cause Program 2 to be loaded from tape and RUN automatically.

When the game starts, you will see a demonstration of the Crazy Climber in action. After this brief display, he will come to a stop, and you can start play by pressing the fire button.

If the Crazy Climber falls, the game ends and your score is displayed. Simply press the fire button to start another game. The climber will fall if *any* contact is made with a window. It's easy going until your score reaches 100. At this point, you'll have to contend with falling flowerpots. At 300, the flowerpots will stop falling, but you'll have to watch out for birds flying from the left side of the screen. If you reach 600, you've made it to the top of the building, and you start at the bottom of the next building.

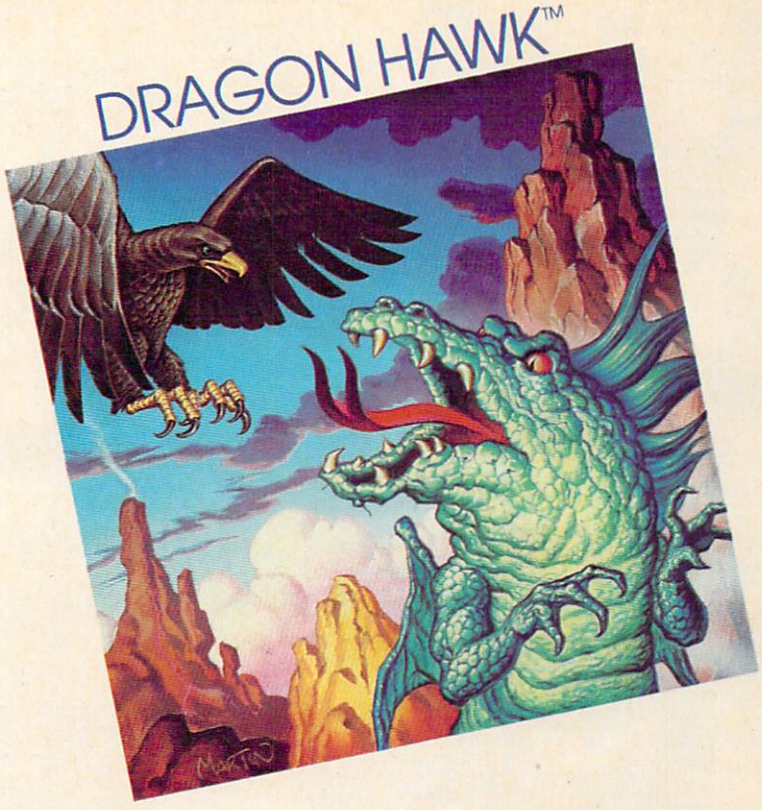
The 64 Version

In this version, there are some major differences in play. First, plug the joystick into Port 1. Hit the space bar to start the game. Unlike the VIC version, you can climb onto a window as long as you have some contact with the wall. A variety of objects are tossed down at you – TVs, pianos, barbells, safes (it's one of those wild and crazy apartment buildings) – and they come twice as fast after your score reaches 150.

This version also includes a high score feature. Pressing the space bar will start a new game.

If you'd rather not type in the program, I'll make a copy (VIC version only) if you send a blank tape or disk, SASE, and $3 to:

Ted Reynolds
145 North Broadway #18
Tooele, UT 84074



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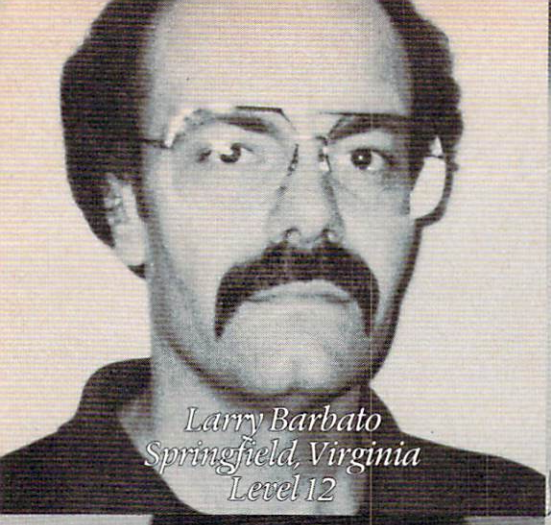
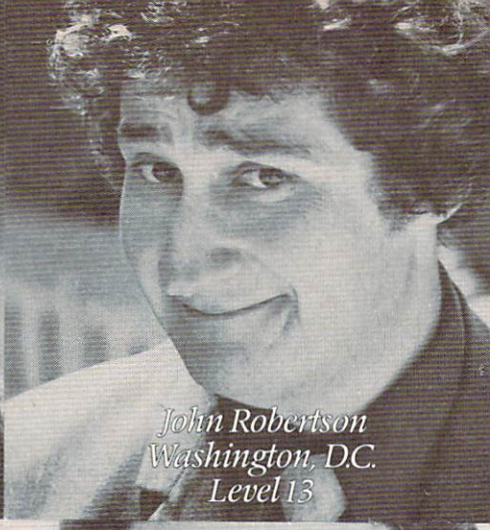


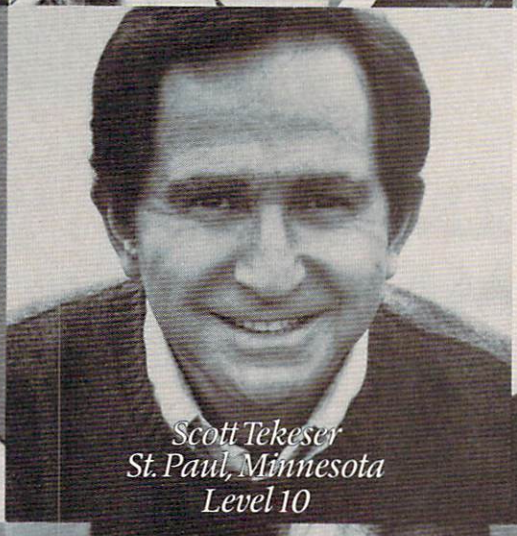
Larry Barbato
Springfield, Virginia
Level 12

Cindy Horne
Portland, Oregon
Level 11

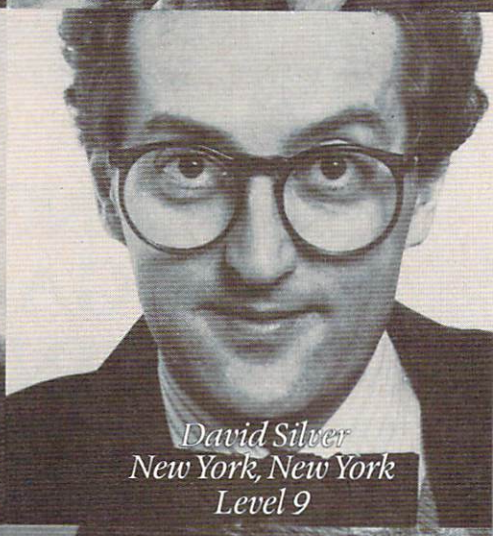


John Robertson
Washington, D.C.
Level 13

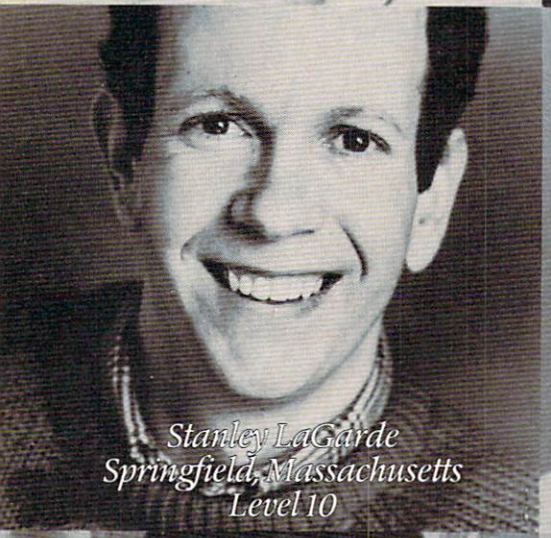
Mark E. Renne
Bozeman, Montana
Level 14



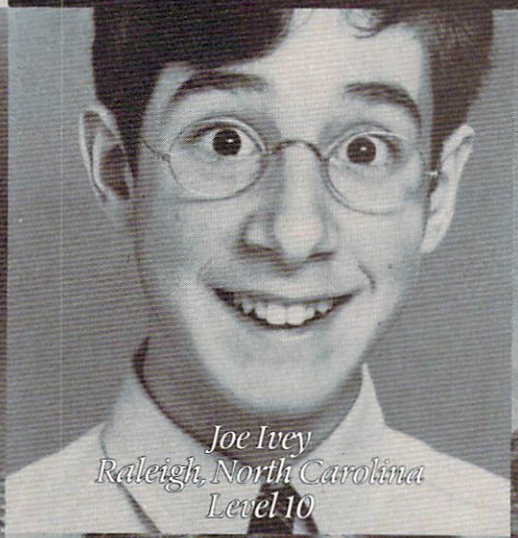
Scott Tekeser
St. Paul, Minnesota
Level 10



David Silver
New York, New York
Level 9



Stanley LaGarde
Springfield, Massachusetts
Level 10



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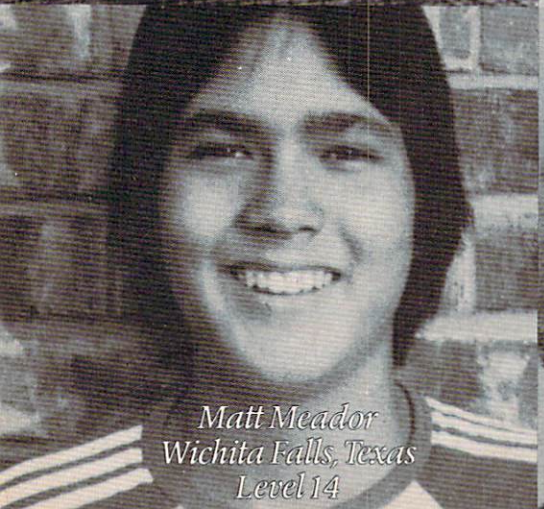
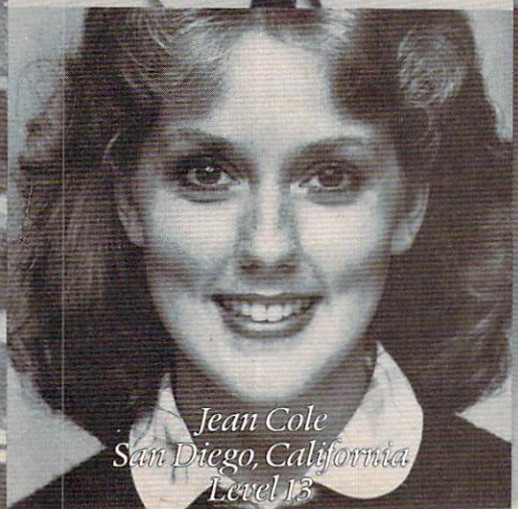
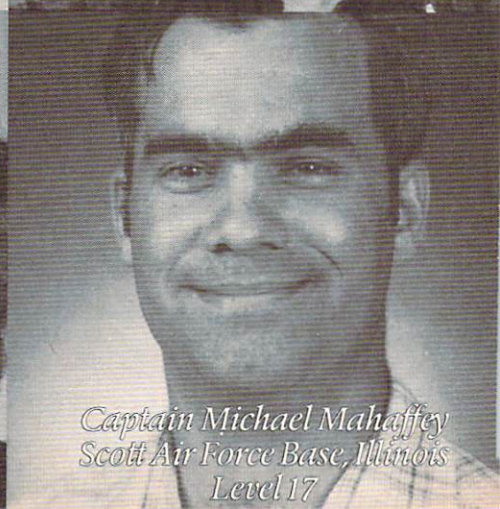


Matt Meador
Wichita Falls, Texas
Level 14



Jean Cole
San Diego, California
Level 13



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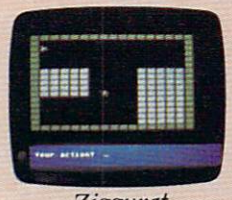
Dunzhin

Kaiv

Wylde



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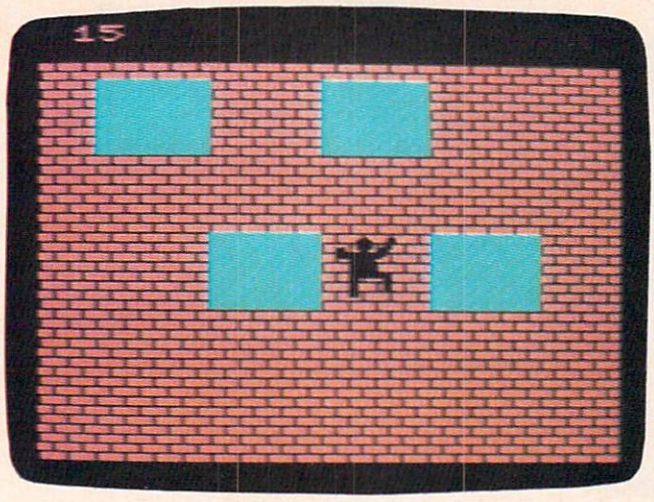

The climber is approaching an open window in the VIC version of "Crazy Climber."

Program 1:
VIC Crazy Climber, BASIC Loader

```
90 POKE56,28:POKE52,28:CLR
100 FORA=7168TO7432:READD:POKEA,D:NEXT
110 PRINT"{CLR}{4 SPACES}"CHR$(34)"CRAZYC
    LIMBER"CHR$(34)
115 POKE631,19:POKE632,131:POKE198,2:NEW
120 DATA0,247,247,247,0,127,127,127,0,119
    ,119,119,0,127,127,127
130 DATA0,247,199,199,0,67,99,97,0,247,22
    7,193,0,65,65,99
140 DATA0,247,227,227,0,71,7,15,0,247,247
    ,247,0,127,113,113
150 DATA0,247,227,193,0,65,65,99,0,247,24
    7,247,0,127,15,15
160 DATA64,170,85,42,60,60,60,24,191,85,1
    70,213,195,195,195,231
170 DATA0,240,244,247,0,127,127,127,0,0,0
    ,0,0,0,0,0
180 DATA0,23,55,247,0,127,127,127,0,240,2
    40,247,0,127,127,127
190 DATA0,0,0,0,0,0,0,0,0,7,7,119,0,127,1
    27,127
200 DATA143,135,195,225,240,0,0,240,255,2
    55,255,255,31,95,15,31
210 DATA0,247,247,247,0,127,127,127,0,0,0
    ,23,0,31,31,31
220 DATA0,7,7,199,0,71,71,71,0,224,224,22
    7,0,99,99,99
230 DATA0,0,0,240,0,120,120,120,0,247,247
    ,247,0,127,127,127
240 DATA255,255,255,255,248,250,240,248,2
    41,225,195,135,15,0,0,15
250 DATA0,247,247,247,0,127,127,127,0,23,
    23,247,0,127,127,127
260 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
270 DATA0,240,240,247,0,127,127,127,255,2
    55,255,255,255,255,255,255
280 DATA0,0,0,0,0,0,0,0,0
```

Program 2: VIC Crazy Climber, Main Program

```
1 BN=1:Z=1:GOTO8
2 PRINT"{HOME}{2 DOWN}";BK$:ONZGOTO27,55
3 PRINT"{HOME}{2 DOWN}";W$:ONZGOTO27,55
4 PRINT"{HOME}{2 DOWN}";W1$:ONZGOTO27,55
5 PRINTBK$:GOTO66
6 PRINTW$:GOTO66
7 PRINTW1$:GOTO66
8 FORA=828TO907:READD:POKEA,D:NEXTA
9 DATA169,233,133,1,169,31,133,2,169,2,13
  3,0,162,242,160,0
10 DATA177,1,160,22,145,1,198,1,169
11 DATA255,197,1,208,2,198,2,202,208,235,
   198,0,208,229,96
12 DATA169,233,133,1,169,151,133,2,169,2,
   133,0,162,242,160,0
13 DATA177,1,160,22,145,1,198,1,169
14 DATA255,197,1,208,2,198,2,202,208,235,
   198,0,208,229,96
15 P1=37151:P2=37152:LC=7922
16 PRINT"{CLR}":POKE36869,255:POKE36879,8
   :X=6:POKE36876,220:POKE37154,127
17 SN=36876:VL=36878
18 A$(1)="{RED}ECD{DOWN}{3 LEFT}MKL{DOWN}
   {2 LEFT}ST{DOWN}{2 LEFT}[":A$(2)="
   {RED}BCG{DOWN}{3 LEFT}JKO{DOWN}
   {3 LEFT}UV{DOWN}{LEFT}↑"
19 W$="{RED}@@{CYN}<<<<{RED}@@@@{CYN}
   <<<<{RED}@@@@@@@"
20 BL$="@@@{DOWN}{3 LEFT}@@@{DOWN}
   {3 LEFT}@@@{DOWN}{3 LEFT}@@@"
21 MP$="{HOME}{11 DOWN}"
22 BK$="{RED}@@@@@@@@@@@@@@@@@@@@@"
23 W1$="{RED}@@@@@@{CYN}<<<<{RED}@@@@
   {CYN}<<<<{RED}@@@"
24 DN$="{22 DOWN}"
25 PRINT"{DOWN}";:FORA=0TO19:PRINTBK$:NEX
   T
26 PRINT"{HOME}{2 DOWN}":FORA=0TO3:PRINTW
   $:NEXT
27 PRINTMP$;TAB(X+M);A$(1+M):FORA=0TO100:
   NEXT
28 PRINTMP$;TAB(X+M);BL$:SYS828:SYS868:PR
   INT"{HOME}{RVS}";G
29 POKE36878,5:POKE36878,0
30 IFM=0THENM=1:GOTO32
31 IFM=1THENM=0:GOTO32
32 G=G+1:IFG>=50ANDG<58THENPRINT"{HOME}
   {2 DOWN}{RVS}{WHT} C{RED}R{CYN}A{PUR}Z
   {GRN}Y {BLU}C{YEL}L{WHT}I{RED}M{CYN}B
   {PUR}E{GRN}R":GOTO27
33 IFG=58THEN36
34 L=L+1:ONLGOTO2,2,2,2,3,3,3,3,2,2,2,2
35 L=0:GOTO34
36 PRINTMP$;TAB(X+M);A$(1+M)
37 FORA=1TO1000:NEXT:Y=7
38 PRINT"{CLR}{DOWN}":FORA=0TO19:PRINTBK$
   :NEXT
39 PRINT"{HOME}{2 DOWN}":FORA=1TO4:PRINTW
   1$:NEXT
40 PRINT"{HOME}{22 DOWN}";BK$;"{HOME}"
41 PRINTMP$;LEFT$(DN$,Y);TAB(X+M);A$(1+M)
42 IF(PEEK(37151)AND32)<>0THEN42
43 Z=2:G=0
44 J0=-((PEEK(P1)AND16)=0):J1=-((PEEK(P1)
   AND8)=0)
45 J2=-((PEEK(P1)AND4)=0):J3=-((PEEK(P2)A
   ND128)=0)
46 IFG>=100ANDG<299THEN67
47 IFG>=300ANDG<599THEN72
48 IFG>=600THEN77
49 IFPEEK(P1)+PEEK(P2)=373THEN44
50 PRINTMP$;LEFT$(DN$,Y);TAB(X+M);BL$;"
   {HOME}{RVS}";SC
51 IFJ0THENX=X-1:XL=1:IFX<0THENX=0
```

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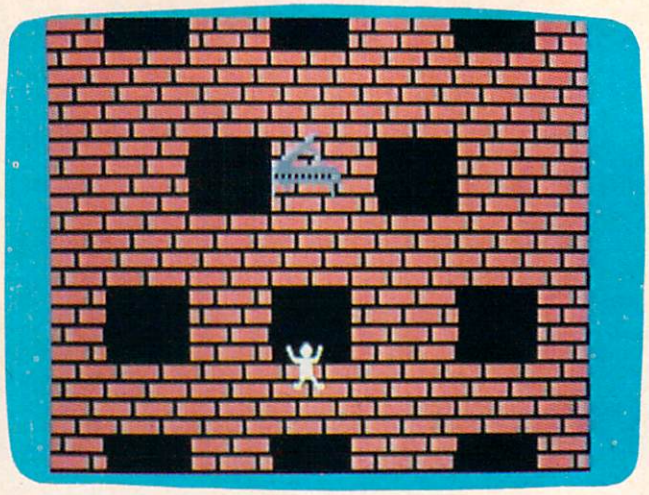
```
52 IFJ1THENG=G-1:SC=SC-1:YL=-1:Y=Y+1:IFY>
   7THENY=7:G=G+1:SC=SC+1
53 IFJ2THENG=G+1:SC=SC+1:YL=1:Y=Y-1:IFY<Ø
   THENY=Ø:GOTO59
54 IFJ3THENX=X+1:XL=-1:IFX>17THENX=17
55 M=(255-M)AND1:POKE36878,5:POKE36878,Ø
56 ZX=LC+X+M+(22*Y)
57 IFPEEK(ZX)ORPEEK(ZX+2)ORPEEK(ZX+66)ORP
   EEK(ZX+68)THEN63
58 PRINTMP$;LEFT$(DN$,Y);TAB(X+M);A$(1+M)
   :GOTO44
59 SYS828:SYS868:IFPT=1THENPP=PP+22:PM=PM
   +1
60 IFBD=1THENBP=BP+22
61 L=L+1:ONLGOTO2,2,2,2,3,3,3,3,2,2,2,2,4
   ,4,4,4
62 L=Ø:GOTO61
63 PRINT"{HOME}{22 DOWN}";:POKESN,250:POK
   EVL,10:FORA=1TOG
64 L=L+1:ONLGOTO6,6,6,6,5,5,5,5,7,7,7,7,5
   ,5,5,5
65 POKESN,PEEK(SN)-1:L=Ø:GOTO64
66 NEXTA:PRINT"{CLR}":X=6:L=Ø:POKESN,220:
   POKEVL,Ø:PRINT"{RVS}{WHT}SCORE:"G"
   {RED}":SC=SC-G:GOTO37
67 IFPT=1THENPM=PM+1:IFPM=>20THENPT=Ø:PM=
   Ø:POKEPP,PL
68 IFPT=ØTHENPP=INT(RND(1)*21)+7724:PT=1:
   PL=PEEK(PP)
69 POKEPP,PL:PP=PP+22:PL=PEEK(PP)
70 IFPL<>31ANDPL<>ØTHENPL=Ø:PP=7746:GOTO6
   3
71 POKEPP,9:GOTO49
72 IFBD=1THENBH=BH+1:IFBH>=19THENBD=Ø:BH=
   Ø:POKEBP,BL:POKEBP-1,B1
73 IFBD=ØTHENBP=INT(RND(1)*10)*22+7725:BD
   =1:BL=PEEK(BP):B1=PEEK(BP-1)
74 POKEBP,BL:POKEBP-1,B1:BP=BP+1:BL=PEEK(
   BP):B1=PEEK(BP-1)
75 IFBL<>31ANDBL<>ØTHENBL=Ø:BP=7746:GOTO6
   3
76 POKEBP,17:POKEBP-1,16:GOTO49
77 PRINT"{CLR}":POKE36869,240:BN=BN+1
78 PRINT"{3 RIGHT}YOU MADE IT!!":PRINT"NO
   W FOR BUILDING #";MID$(STR$(BN),2)
79 FORA=1TO2500:NEXT:POKE36869,255:GOTO37
```

Program 3: Crazy Climber, 64 Version

By Gregg Peele, Assistant Programming Supervisor

```
100 GOTO190
110 S=54272:FORE=STOS+28:POKEE,Ø:NEXT
120 POKE54296,15 :POKE54277, 51 :POKE5427
    8, 252
130 POKE 54276, 129 :POKE 54273, 10 :POKE
    54272, 100
140 FORT=1TO 200:NEXT:POKE54276,128:RETUR
    N
150 S=54272:FORE=STOS+28:POKEE,Ø:NEXT
160 POKE54296,15 :POKE54277,52 :POKE54278
    ,244
170 POKE 54276,17:POKE54272,2:RETURN
180 FORHG=200TO0STEP-1:POKE54273,HG:NEXT
190 POKE53281,1:POKE646,Ø:SC=Ø:HS=Ø
200 TI$="000000"
210 PRINT"{CLR}"SPC(3)"ENTERING NECESSARY
     DATA FOR SPRITES"
220 PRINTSPC(8)"AND MACHINE LANGUAGE"
230 PRINT"{14 DOWN}{2 RIGHT}TAKE A BREAK
    {SPACE}FOR ABOUT FOUR MINUTES"
240 POKE2,Ø:POKE191,48
```



A piano is about to fall on the climber in the 64 version of "Crazy Climber."

```
250 K=43008:L=1024
260 FORT=12288TO13312+4*LSTEP3:POKET,239:
    POKET+1,239:POKET+2,250
270 PRINT"{HOME}";SPC(16)"{7 DOWN}";RIGHT
    $(TI$,3):NEXT
280 FORR=1TO24
290 READ DA
300 FORT=DA TO DA+5:POKET,32:POKET+40,32:
    POKET+80,32:POKET+120,32
310 NEXT:PRINT"{HOME}";SPC(16)"{7 DOWN}";
    RIGHT$(TI$,3):NEXT
320 DATA12332,12344,12358,12698,12712,130
    12,13024,13038
330 DATA13332,13344,13358,13698,13712,140
    12,14024,14038
340 DATA14332,14344,14358,14698,14712,150
    12,15024,15038
350 D1=Ø:D2=128:GOSUB620:GOSUB950:D1=64:D
    2=-128:GOSUB660:GOSUB1460:POKE50688,1
360 PRINT"{CLR}";:SYS49152:POKE53248,160:
    SYS49517
370 V=53248:SC=Ø:POKEV+21,255:POKEV+1,215
380 V=53248:POKEV+39,1:IFPEEK(700)=ØTHENS
    1=13:S2=15:POKE53272,20
390 IFSC>50ANDPEEK(V+1)>99AND((PEEK(56321
    )AND15)=14)THENPOKEV+1,(PEEK(V+1)-.3)
400 IF((PEEK(53278)AND1)OR(PEEK(53279)AND
    1)=Ø)THENQ=1:GOTO560
410 POKE700,Ø
420 IFSC>150THENPOKE50688,Ø
430 SYS49152+24
440 IFPEEK(52993)<20THENPOKE2041,228+RND(
    Ø)*4:POKEV+40,(PEEK(2041)-228)+4
450 POKEV+23,(PEEK(V+23)OR2):POKEV+29,(PE
    EK(V+29)OR2)
460 TR=ER:ER=RND(Ø)*320+24:IFPEEK(52993)<
    230THENER=TR
470 IF ER>255THENIFER-255<30THENPOKEV+16,
    (PEEK(V+16)OR2):POKEV+2,ER-255
480 IF ER<=255THENPOKEV+2,ER:POKEV+16,(PE
    EK(V+16)AND253)
490 IF(PEEK(56321)AND15)<>15THENPOKE2040,
    S1:POKE54296,5:POKE54296,Ø
500 IF((PEEK(53278)AND1)OR(PEEK(53279)AND
    1)=Ø)THENQ=1:GOTO560
510 POKEV+29,(PEEK(V+29)OR2):POKEV+23,(PE
    EK(V+23)OR2)
```

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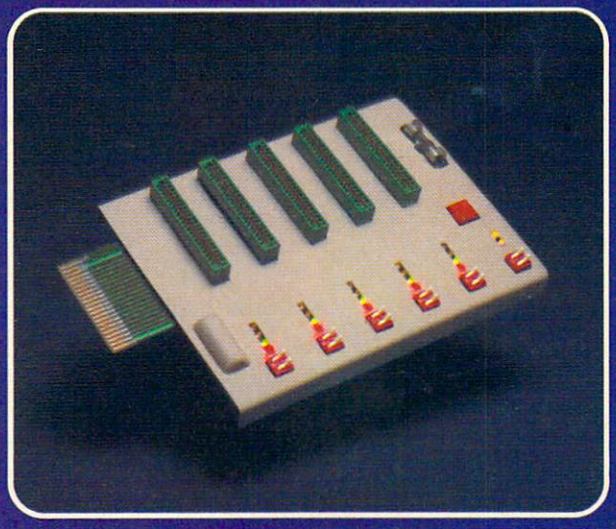

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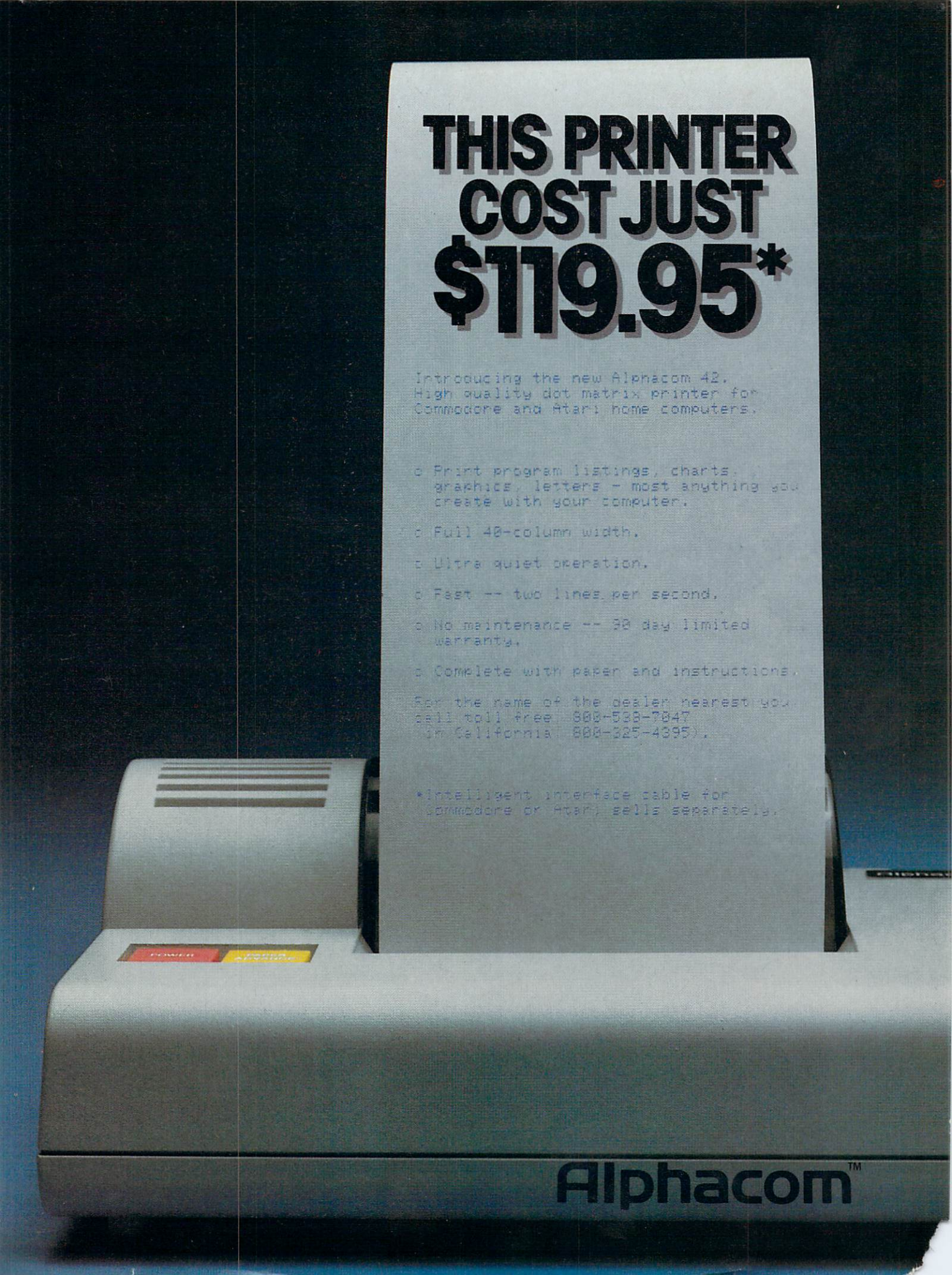
```
520 IF(PEEK(56321)AND15)=15THENPOKE2040,1
    1
530 IFPEEK(700)THENS1=14:S2=11
540 IF((PEEK(53278)AND1)OR(PEEK(53279)AND
    1)=0)THENQ=1:GOTO560
550 Q=0:GOTO590
560 POKEV+21,PEEK(V+21)AND1
570 GOSUB150:FORT=1TO100:SYS49469:POKEV+1
    ,(PEEK(V+1)+1)AND230
580 POKE54273,ABS(T-100):NEXT:Q=0:POKE532
    78,0:GOSUB110:GOSUB1360
590 POKEV+21,255:SYS49152+24
600 IF(PEEK(56321)AND15)<>15THENPOKE2040,
    S2:SC=SC+1
610 GOTO380
620 I1=832
630 READ A:IF A=256 THEN 660
640 PRINT"{HOME}";SPC(16)"{7 DOWN}";RIGHT
    $(TI$,3)
650 POKE I1,A:I1=I1+1:GOTO 630
660 FORI=0TO20
670 FORJ=2TO0STEP-1
680 PRINT"{HOME}";SPC(16)"{7 DOWN}";RIGHT
    $(TI$,3)
690 M1=832+D1+I*3+J:M2=832+D2+I*3+(2-J)
700 FORK=7TO0STEP-1
710 PRINT"{HOME}";SPC(16)"{7 DOWN}";RIGHT
    $(TI$,3)
720 B1=2↑K:B2=2↑(7-K)
730 V=-((PEEK(M1)ANDB1)<>0)
740 POKEM2,PEEK(M2)OR(B2*V)
750 NEXTK,J,I:RETURN
760 DATA 0,0,0,0,56,0,0
770 DATA 124,6,0,254,6,0,254
780 DATA 12,0,124,12,0,56,24
790 DATA 7,255,240,15,255,224,24
800 DATA 254,0,96,254,0,192,254
810 DATA 0,0,254,0,0,254,0
820 DATA 0,255,224,1,255,240,3
830 DATA 0,24,6,0,14,12,0
840 DATA 14,120,0,0,120,0,0
850 DATA 122,0,0,0,0,56,0
860 DATA 48,124,6,48,254,6,24
870 DATA 254,12,24,124,12,12,56
880 DATA 24,15,255,240,7,255,224
890 DATA 0,254,0,0,254,0,0
900 DATA 254,0,0,254,0,0,254
910 DATA 0,0,254,0,1,254,0
920 DATA 3,6,0,6,3,0,124
930 DATA 1,224,120,1,224,0,0
940 DATA 0,122,0,256
950 I=14592
960 READ A:IF A=256 THEN RETURN
970 PRINT"{HOME}";SPC(16)"{7 DOWN}";RIGHT
    $(TI$,3)
980 POKE I,A:I=I+1:GOTO 960
990 DATA 0,0,0,0,6,0,0
1000 DATA 28,0,0,120,0,0,252
1010 DATA 0,3,230,0,15,131,0
1020 DATA 62,1,128,127,255,248,127
1030 DATA 255,252,85,85,92,127,255
1040 DATA 252,68,0,20,68,0,20
1050 DATA 64,0,16,0,0,0,0
1060 DATA 0,0,0,0,0,0,0
1070 DATA 0,0,0,0,0,0,0
1080 DATA 0,255,255,224,191,255,160
1090 DATA 192,0,96,223,255,96,223
1100 DATA 255,96,223,255,108,223,255
1110 DATA 124,223,31,248,222,15,224
1120 DATA 222,15,96,223,31,96,223
1130 DATA 255,96,223,255,96,223,255
1140 DATA 96,223,255,96,223,255,96
1150 DATA 128,0,32,255,255,224,224
1160 DATA 0,224,224,0,224,224,0
1170 DATA 224,255,0,0,0,0,0
1180 DATA 0,0,0,0,0,0,0
1190 DATA 0,0,0,0,0,0,16
1200 DATA 0,8,56,0,28,56,0
1210 DATA 28,255,255,255,255,255,255
1220 DATA 56,0,28,56,0,28,16
1230 DATA 0,8,0,0,0,0,0
1240 DATA 0,0,0,0,0,0,0
1250 DATA 0,0,0,0,0,0,0
1260 DATA 0,0,0,0,0,0,4
1270 DATA 0,32,2,0,64,1,0
1280 DATA 128,0,129,0,0,66,0
1290 DATA 0,36,0,15,255,240,8
1300 DATA 0,80,8,255,16,9,255
1310 DATA 144,9,153,144,9,231,144
1320 DATA 9,189,144,9,195,144,8
1330 DATA 255,16,8,0,16,15,255
1340 DATA 240,3,0,192,3,0,192
1350 DATA 3,0,192,0,159,256
1360 POKEV+21,0
1370 POKE53281,1:PRINTCHR$(147);"{BLK}
     {7 DOWN}{10 RIGHT}YOU HAVE FALLEN"
1380 PRINT"{9 RIGHT}{3 DOWN}YOUR SCORE WA
     S ";SC:IF SC>HSTHENHS=SC
1390 PRINT"{9 RIGHT}{3 DOWN}HIGH SCORE WA
     S ";HS
1400 PRINT"{DOWN}{7 RIGHT}{4 INST}HOLD FI
     RE TO PLAY AGAIN"
1410 FORT=1TO1000:GETA$:POKE198,0:NEXT
1420 POKE2,0:POKE191,48
1430 IFPEEK(V+3)>30THEN1430
1440 IFPEEK(197)=64ANDPEEK(V+3)>30THEN144
     0
1450 POKE50688,1:SYS49152:POKEV+21,255:GO
     TO370
1460 I=49152
1470 READ A:IF A=256 THEN RETURN
1480 PRINT"{HOME}";SPC(16)"{7 DOWN}";RIGH
     T$(TI$,3)
1490 POKE I,A:I=I+1:GOTO1470
1500 DATA 169,48,133,254,169,0,133
1510 DATA 253,141,252,207,141,253,207
1520 DATA 165,253,141,254,207,165,254
1530 DATA 141,255,207,173,254,207,133
1540 DATA 253,173,255,207,133,254,160
1550 DATA 0,177,253,153,0,4,200
1560 DATA 208,248,230,254,160,0,177
1570 DATA 253,153,0,5,200,208,248
1580 DATA 230,254,160,0,177,253,153
1590 DATA 0,6,200,208,248,230,254
1600 DATA 160,0,177,253,153,0,7
1610 DATA 200,192,232,208,246,173,1
1620 DATA 220,41,15,201,13,208,44
1630 DATA 24,169,40,109,254,207,141
1640 DATA 254,207,169,0,109,255,207
1650 DATA 141,255,207,56,173,254,207
1660 DATA 233,0,133,2,173,255,207
1670 DATA 233,52,5,2,144,10,169
1680 DATA 48,141,255,207,169,0,141
1690 DATA 254,207,173,1,220,41,15
1700 DATA 201,14,208,51,56,173,254
1710 DATA 207,233,40,141,254,207,173
1720 DATA 255,207,233,0,141,255,207
1730 DATA 56,173,254,207,233,0,133
1740 DATA 2,173,255,207,233,48,5
1750 DATA 2,176,17,24,173,254,207
1760 DATA 105,232,141,254,207,173,255
1770 DATA 207,105,3,141,255,207,169
```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```
1780 DATA 216,133,252,169,0,133,251
1790 DATA 169,10,160,0,162,4,145
1800 DATA 251,200,208,251,230,252,202
1810 DATA 208,246,169,0,141,33,208
1820 DATA 173,1,220,41,15,201,7
1830 DATA 208,36,173,16,208,41,1
1840 DATA 240,7,173,0,208,201,60
1850 DATA 176,22,24,173,0,208,105
1860 DATA 16,141,0,208,173,16,208
1870 DATA 105,0,141,16,208,169,1
1880 DATA 141,188,2,173,1,220,41
1890 DATA 15,201,11,208,36,173,16
1900 DATA 208,41,1,208,7,173,0
1910 DATA 208,201,32,144,22,56,173
1920 DATA 0,208,233,16,141,0,208
1930 DATA 173,16,208,233,0,141,16
1940 DATA 208,169,1,141,188,2,96
1950 DATA 76,24,192,24,169,40,109
1960 DATA 254,207,141,254,207,169,0
1970 DATA 109,255,207,141,255,207,56
1980 DATA 173,254,207,233,0,133,2
1990 DATA 173,255,207,233,52,5,2
2000 DATA 144,10,169,48,141,255,207
2010 DATA 169,0,141,254,207,76,24
2020 DATA 192,120,169,122,141,20,3
2030 DATA 169,193,141,21,3,88,96
2040 DATA 165,161,166,161,142,0,207
2050 DATA 165,161,205,0,207,240,5
2060 DATA 169,0,141,1,207,238,1
2070 DATA 207,173,1,207,141,3,208
2080 DATA 173,0,198,208,9,238,1
2090 DATA 207,173,1,207,141,3,208
2100 DATA 76,49,234,256
```

Program 4: Crazy Climber For The TI-99/4A

Extended BASIC Version by Pat Parrish, Programming Supervisor

```
100 DIM D(7),E(7),G(4),C$(4)
110 GOTO 140
120 REM RANDOMLY PICK WINDOW & PRIN
    T SINISTER MAN
130 V=INT(RND*8):: CALL DELSPRITE(#
    1):: CALL SPRITE(#4,96,2,D(V)*8
    +1,E(V)*8+1):: R=-1 :: Q=-1 ::
    RETURN
140 HS=0 :: RANDOMIZE
150 GOSUB 480
160 GOSUB 790
170 GOSUB 670
180 T=0 :: U=.1 :: Q=0 :: R=0 :: SC
    =0 :: B=112 :: Z=-3 :: ROW=13 :
    : COL=15
190 CALL SPRITE(#2,B,2,ROW*8+1,COL*
    8+1)
200 IF R THEN CALL SPRITE(#1,G(INT(
    RND*5)),INT(RND*14)+3,(D(V)+4)*
    8+1,E(V)*8+1,15,0):: SC=SC+10 :
    : R=0 :: CALL DELSPRITE(#4)
210 IF (RND<U)*(R=0)*(Q=0)THEN GOSU
    B 130
220 CALL KEY(0,K,ST)
230 IF K=69 THEN ROW=ROW-1 :: IF (R
    OW=-1)THEN ROW=23 :: SC=SC+100
    :: U=U+SGN(1-U)/20 :: GOTO 280
    ELSE 280
240 IF K=83 THEN COL=COL-SGN(COL-2)
    *2 :: GOTO 280
250 IF K=68 THEN COL=COL+SGN(26-COL
    )*2 :: GOTO 280
260 IF K=88 THEN ROW=ROW+1 :: IF (R
    OW=24)THEN ROW=0 :: SC=SC-100 :
    : GOTO 280 ELSE 280
270 GOTO 290
280 B=228-B :: Z=197-Z :: CALL SPRI
    TE(#2,B,2,ROW*8+1,COL*8+1):: CA
    LL SOUND(10,Z,2)

290 CALL COINC(ALL,C1):: IF C1 THEN
     320
300 CALL POSITION(#1,XROW,XCOL):: I
    F XROW<180 THEN 200
310 CALL DELSPRITE(#1):: Q=0 :: GOT
    O 200
320 T=1 :: V=2 :: CALL DELSPRITE(#1
    ):: CALL SAY("UHOH"):: REM REMO
    VE "CALL SAY" IF W/OUT SPEECH S
    YNTHESIZER
330 IF TP THEN T=40
340 CALL SPRITE(#2,108,2,ROW*8+1,CO
    L*8+1,25,0):: FOR I=1 TO 95 ::
    NEXT I :: CALL MOTION(#2,10,0)
```

TI-99/4A Version Notes

Pat Parrish, Programming Supervisor

In the TI-99/4A version of this game (written in Extended BASIC), you are the Crazy Climber, scrambling up the face of a building while avoiding numerous objects (piano, iron, broom, safe, barbells) tossed from the windows above. These objects are actually *hurled* down upon you by a relentless, sinister fellow who appears just briefly before throwing each object. If you are quick, you can dodge these oncoming objects. No one knows why he throws things; it's a quirk. Be ready to meet the challenge. For as the game progresses, the villain strikes with greater frequency.

In this game, you move the Crazy Climber over a stationary building with the E, S, D, and X keys. The screen will wrap around when you reach the top or bottom. A hundred points are awarded for crossing the top of the screen, while an equal number are deducted for crossing the bottom. In addition, ten points are given for each falling object that you avoid.

The game ends when you are hit by a falling object or are pushed from a window by the villain. Thus, you are allowed to climb over windows in this version, but you're taking a chance. If the villain emerges while you are in a window, it's curtains for you. (You'll be relieved to discover that the Crazy Climber carries a parachute.)

One line in this program requires that you have a TI Speech Synthesizer connected to your TI-99/4A. If you don't have this peripheral, remove the CALL SAY("UHOH") statement in line 320.

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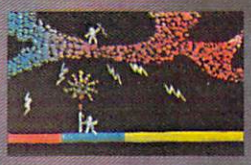

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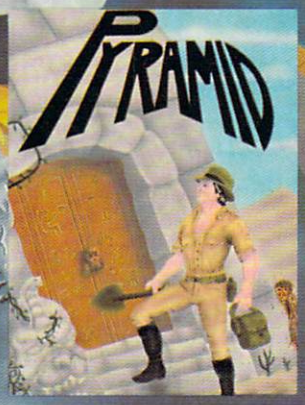

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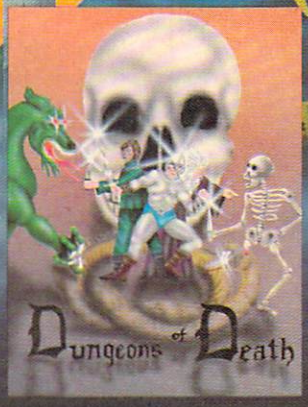

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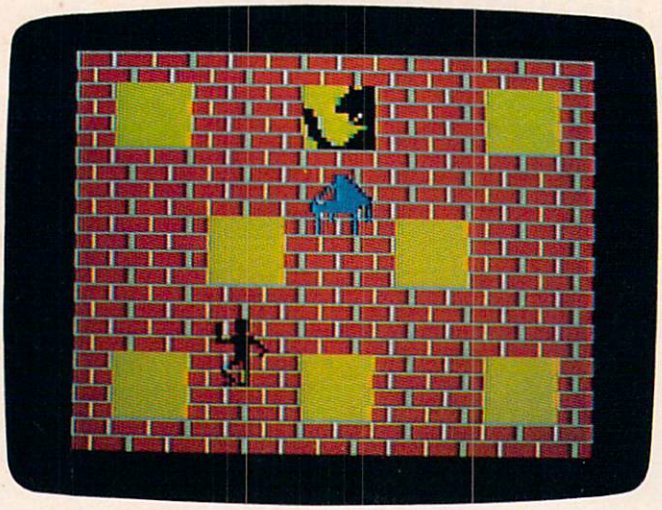

TI version of "Crazy Climber."

```
350 CALL SOUND(-50,-7,2):: CALL SPR
    ITE(#3,104,16,(ROW+2)*8+1,COL*8
    +1,10,0)
360 CALL SOUND(80,5000-T*40,V):: T=
    T+1 :: IF T<65 THEN 360
370 CALL POSITION(#1,DR,DC,#3,CR,CC
    ):: IF DR>192 THEN CALL DELSPRI
    TE(#1)
380 IF CR>165 THEN CALL DELSPRITE(#
    2,#3):: GOTO 400
390 GOTO 360
400 IF TP THEN GOTO 910
410 CALL DELSPRITE(ALL):: FOR L=1 T
    O 100 :: NEXT L :: CALL CLEAR :
    : CALL SCREEN(14)
420 DISPLAY AT(10,5):"YOUR SCORE :
    ";SC
430 IF SC>HS THEN HS=SC
440 DISPLAY AT(13,5):"HIGH SCORE :
    ";HS
450 DISPLAY AT(16,5):"PLAY AGAIN ?
    " :: ACCEPT AT(16,19)BEEP VALID
    ATE("YN")SIZE(1):ANS$
460 IF ANS$="Y" THEN 170
470 STOP
480 REM DEFINE CUSTOM CHAR
490 FOR I=120 TO 121
500 READ A$
510 CALL CHAR(I,A$)
520 NEXT I
530 DATA FF8080808080808080,FF0101010
    1010101
540 CALL MAGNIFY(4):: CALL CHAR(100
    ,"")
550 CALL CHAR(112,"03232321273F0303
    0303060810080409808080000C0E0908
    8908080808080808080")
560 CALL CHAR(116,"0101010003070911
    0901010101010101C0C4C484E4FCC0C
    0C0C0601008102090")
570 FOR I=0 TO 4 :: READ C$(I):: G(
    I)=124+4*I :: CALL CHAR(G(I),C$
    (I)):: NEXT I
580 DATA 2070FF702000000000000000000
    0000000040EFF0E040000000000000000
    0000000
590 DATA 00000000 3F3F3F3F3F3F3F3F
    3F303000000000F8F8F9DAFCF8F8F8F
    8F81818
600 DATA 00000101030509112 73F3F1212
    1010100000C0E0F0F8FCFEFEFAF2121
    2101010
610 DATA 0300000F0F0F1F0000000000000
    000000E02020E0F0F0F8000000000000
    0000000
620 DATA 0000000000000000001031E3C7C
    FCF87001030606C183060C0800000000
    0000000
630 CALL CHAR(104,"01070F1F1F151008
    0804040202010100 80E0F0F8F858081
    0102020404080800 0")
640 CALL CHAR(108,"0204050701010101
    0202020600000000 804040C080808080
    4040406000000000")
650 CALL CHAR(96,"0000000000001C1C0E
    0E0607070381C1F273F7FFFFFFFF37
    2F1F030F1F3F7FFF")
660 RETURN
670 CALL COLOR(12,1,1):: CALL COLOR
    (9,1,1):: REM SET UP WALL
680 CALL CLEAR :: CALL SCREEN(2)::
    ROW$="xyxyxyxyxyxyxyxyxyxyxyxyxy"
690 ROW2$="yxyxyxyxyxyxyxyxyxyxyxyx
    yxyx"
700 FOR ROW=1 TO 23 STEP 2 :: DISPL
    AY AT(ROW,1):ROW$ :: NEXT ROW
710 FOR ROW=2 TO 24 STEP 2 :: DISPL
    AY AT(ROW,1):ROW2$ :: NEXT ROW
720 FOR ROW=3 TO 6 :: FOR COL=5 TO
    25 STEP 10 :: CALL HCHAR(ROW,CO
    L,100,4):: NEXT COL :: NEXT ROW
730 FOR ROW=19 TO 22 :: FOR COL=5 T
    O 25 STEP 10 :: CALL HCHAR(ROW,
    COL,100,4):: NEXT COL :: NEXT R
    OW
740 FOR ROW=11 TO 14 :: FOR COL=10
    TO 20 STEP 10 :: CALL HCHAR(ROW
    ,COL,100,4):: NEXT COL :: NEXT
    ROW
750 CALL COLOR(12,15,7):: CALL COLO
    R(9,1,11)
760 E(0)=4 :: E(1)=14 :: E(2)=24 ::
     E(3)=9 :: E(4)=19 :: E(5)=4 ::
     E(6)=14 :: E(7)=24
770 D(0)=2 :: D(1)=2 :: D(2)=2 :: D
    (3)=10 :: D(4)=10 :: D(5)=18 ::
     D(6)=18 :: D(7)=18
780 RETURN
790 REM TITLE PAGE
800 CALL CLEAR :: CALL SCREEN(15)
810 ROW$="xyxyxyxyxy" :: ROW2$="yxy
    xyxyxyx"
820 CALL COLOR(12,15,15)
830 FOR ROW=7 TO 23 STEP 2 :: DISPL
    AY AT(ROW,2):ROW$ :: NEXT ROW
840 FOR ROW=8 TO 24 STEP 2 :: DISPL
    AY AT(ROW,2):ROW2$ :: NEXT ROW
850 CALL COLOR(12,15,7)
860 DISPLAY AT(6,19):"T H E" :: DIS
    PLAY AT(8,17):"C R A Z Y" :: DI
    SPLAY AT(10,15):"C L I M B E R"
870 FOR I=1 TO 100 :: NEXT I :: B=1
    16 :: Z=200 :: ROW=19 :: COL=6
880 CALL SPRITE(#2,B,2,ROW*8+1,COL*
    8+1):: CALL SOUND(10,Z,2)
```

```
890 B=228-B :: Z=197-Z :: ROW=ROW-1
    :: FOR I=1 TO 50 :: NEXT I ::
    IF ROW>1 THEN 880
900 TP=-1 :: GOTO 320
910 TP=0 :: DISPLAY AT(16,13):"USE
    E,S,X,D KEYS" :: DISPLAY AT(17,
    13):"TO AVOID FALLING"
920 DISPLAY AT(18,13):"OBJECTS." ::
    DISPLAY AT(20,16):"GOOD LUCK!"
930 FOR I=1 TO 1000 :: NEXT I :: CA
    LL DELSPRITE(#2):: RETURN
940 END                              ©
```


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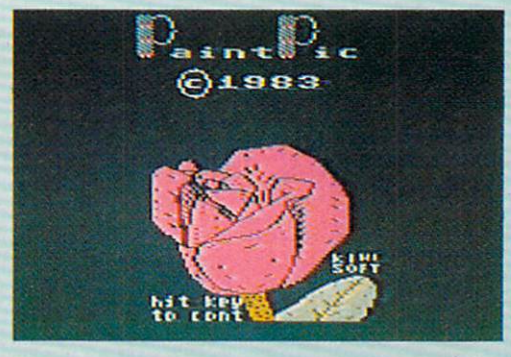

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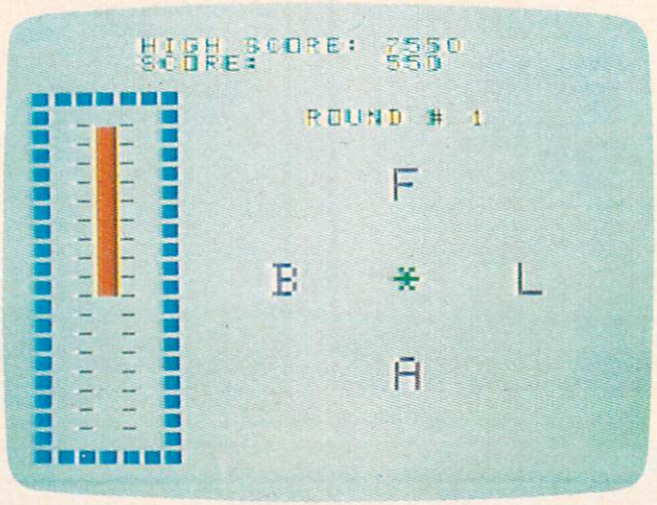
ALPHA BLAST

Dave Miller



Color Computer version of "Alpha Blast."

A test of judgment, speed, and accuracy, this game is a good educational tool for children and fun for adults. Originally written for the Atari, versions are also included for the VIC, TI-99/4A (with Extended BASIC), and Color Computer. Joystick required (optional for TI version).

This game is fun to play and will also sharpen your alphabetizing skills. How many times do you find yourself saying, "Q, R, S, T, U – yes, T comes before U"? I know I've often said it.

The object of "Alpha Blast" is to shoot the four letters displayed on the screen in alphabetical order. Sounds simple enough, but it isn't. And to make it more difficult, you're being timed. For each correct answer you are awarded points based on the internal character set value. Since I am using lowercase letter values, an A would give you 97 points, G would give you 103 points, and so on. If you fail to shoot a letter in the correct order, the value of that letter will be subtracted from your score. If you get all four letters right, you will advance to the next round with new letters to shoot and less time in which to do it. If time runs out before you complete a round, the game ends, giving you a final score and the high score.

This program uses a redefined character set for the gun you use to shoot the characters. Memory location 20 is the timer. You may safely remove lines which contain only REMarks (no GOTOs will reference them).

A challenge: See if you can get past round 25.

Program 1: Alpha Blast – Atari

```
100 GOSUB 630:REM TITLE ROUTINE
110 GOSUB 690:REM REDEFINE CHSET
120 DIM N(4):HIGH=0
130 ROUND=0:SCORE=0:TIME=50
140 GRAPHICS 18:POKE 756,CHSET/256:S
    ETCOLOR 2,6,5:SETCOLOR 0,0,10:SE
    TCOLOR 1,9,6:LASTNUM=0
141 POSITION 15,6:? #6;SCORE
145 REM **** USE INVERSE CONTROL 'F'
     IN 1ST PRINT
150 FOR T=1 TO 10:POSITION 2,T:? #6;
    "{■}":POSITION 1,T:? #6;"_":NEXT
     T
165 REM **** USE INVERSE '*' FOR PRI
    NT
170 POSITION 10,6:? #6;"■":SCRN=PEEK
    (88)+256*PEEK(89):ROUND=ROUND+1:
    POSITION 7,0:? #6;"ROUND ";ROUND
180 TIME=TIME-2:REM SET INCREMENT FO
    R TIMER
185 REM **** RANDOM LETTER GENERATOR
190 N(1)=INT(RND(0)*26)+97:POKE SCRN
    +46,N(1)
200 N(2)=INT(RND(0)*26)+97:POKE SCRN
    +54,N(2):IF N(2)=N(1) THEN 200
210 N(3)=INT(RND(0)*26)+97:POKE SCRN
```

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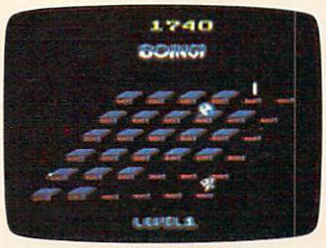

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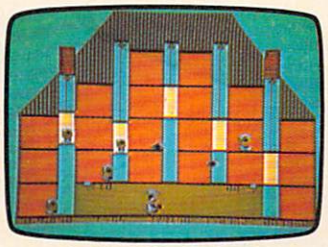

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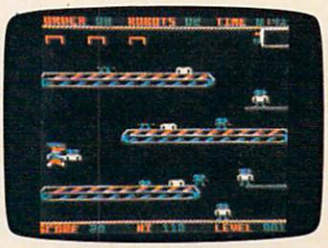

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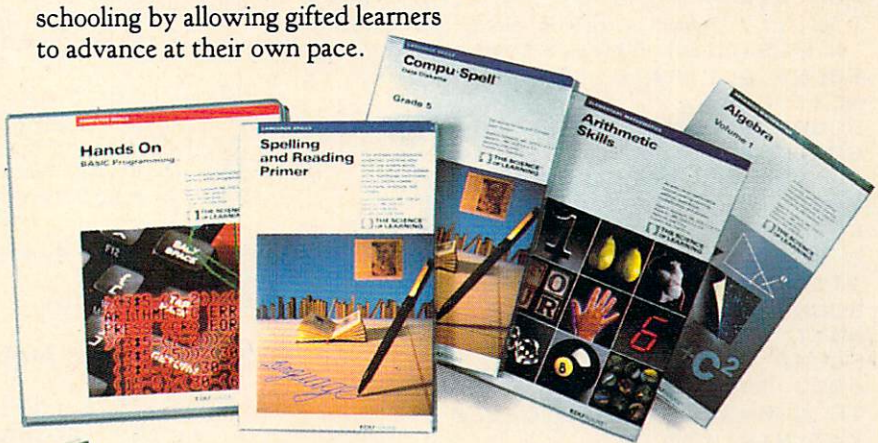

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```
    +206,N(3):IF N(3)=N(2) OR N(3)=N
    (1) THEN 210
220 N(4)=INT(RND(0)*26)+97:POKE SCRN
    +214,N(4):IF N(4)=N(3) OR N(4)=N
    (2) OR N(4)=N(1) THEN 220
225 REM ****  SHOOTING LOOP FOLLOWS
226 REM ****  ! # $ % ARE ALL INVERS
    E
230 ST=STICK(0)
240 IF T=1 THEN GOTO 800
250 IF ST=10 THEN POSITION 10,6:? #6
    ;"■":LOCATE 6,2,NUM:GOTO 320
260 IF ST=9 THEN POSITION 10,6:? #6;
    "■":LOCATE 6,10,NUM:GOTO 390
270 IF ST=6 THEN POSITION 10,6:? #6;
    "■":LOCATE 14,2,NUM:GOTO 460
280 IF ST=5 THEN POSITION 10,6:? #6;
    "■":LOCATE 14,10,NUM:GOTO 530
290 IF N(1)=32 AND N(2)=32 AND N(3)=
    32 AND N(4)=32 THEN 140:REM NEXT
     ROUND IF ALL LETTERS GONE
295 REM ****  CLOCK ROUTINE FOLLOWS
300 IF C+TIME<PEEK(20) THEN C=PEEK(2
    0):POSITION 2,T-1:? #6;" ":POKE
    53279,1:T=T-1:IF C>200 THEN POKE
     20,0:C=0
310 GOTO 230
315 REM ****  BULLET ROUTINES FOLLOW
320 IF NUM=32 THEN GOTO 230
325 Y=5:N(1)=32
330 FOR DIR=9 TO 5 STEP -1:POSITION
    DIR,Y:? #6;".":FOR W=1 TO 5:NEXT
     W:POSITION DIR,Y:? #6;" ":Y=Y-1
340 SOUND 0,DIR*10,10,DIR
350 NEXT DIR
370 SOUND 0,0,0,0
380 GOTO 590
390 IF NUM=32 THEN GOTO 230
395 Y=7:N(2)=32
400 FOR DIR=9 TO 5 STEP -1:POSITION
    DIR,Y:? #6;".":FOR W=1 TO 5:NEXT
     W:POSITION DIR,Y:? #6;" ":Y=Y+1
410 SOUND 0,DIR*10,10,DIR
420 NEXT DIR
440 SOUND 0,0,0,0
450 GOTO 590
460 IF NUM=32 THEN GOTO 230
465 Y=5:N(3)=32
470 FOR DIR=11 TO 15:POSITION DIR,Y:
    ? #6;".":FOR W=1 TO 5:NEXT W:POS
    ITION DIR,Y:? #6;" ":Y=Y-1
480 SOUND 0,DIR*10,10,DIR
490 NEXT DIR
510 SOUND 0,0,0,0
520 GOTO 590
530 IF NUM=32 THEN GOTO 230
535 Y=7:N(4)=32
540 FOR DIR=11 TO 15:POSITION DIR,Y:
    ? #6;".":FOR W=1 TO 5:NEXT W:POS
    ITION DIR,Y:? #6;" ":Y=Y+1
550 SOUND 0,DIR*10,10,DIR
560 NEXT DIR
580 SOUND 0,0,0,0
590 IF LASTNUM>NUM THEN 610:REM CHEC
    K FOR INCORRECT ANSWER
600 GOTO 620
605 REM **** ERROR ROUTINE FOLLOWS
610 SCORE=SCORE-NUM:POSITION 15,6:?
    #6;SCORE
613 FOR W=1 TO 125:SOUND 0,NUM,6,10:
    NEXT W:SOUND 0,0,0,0:FOR W=1 TO
    500:NEXT W:GOTO 140
615 REM **** CORRECT ANS ROUTINE
620 LASTNUM=NUM:SCORE=SCORE+NUM:POSI
    TION 15,6:? #6;SCORE:GOTO 230
625 REM **** TITLE ROUTINE FOLLOWS
630 GRAPHICS 17:SCRN=PEEK(88)+256*PE
    EK(89)
640 FOR I=1 TO 75
650 POKE SCRN+INT(RND(0)*480),INT(RN
    D(0)*26)+33:REM PRINT RANDOM LET
    TERS FOR INTRO
660 SOUND 0,I+75,10,8:NEXT I
670 FOR W=1 TO 50:NEXT W
672 POSITION 5,10:? #6;"__________"
    :POSITION 5,12:? #6;"__________
    "
675 REM **** CHARACTER BETWEEN 'a' A
    ND 'b' IS A CONTROL M
680 POSITION 5,11:? #6;"alpha{M}blas
    t":SOUND 0,0,0,0:POSITION 3,23:?
     #6;"■■■
```

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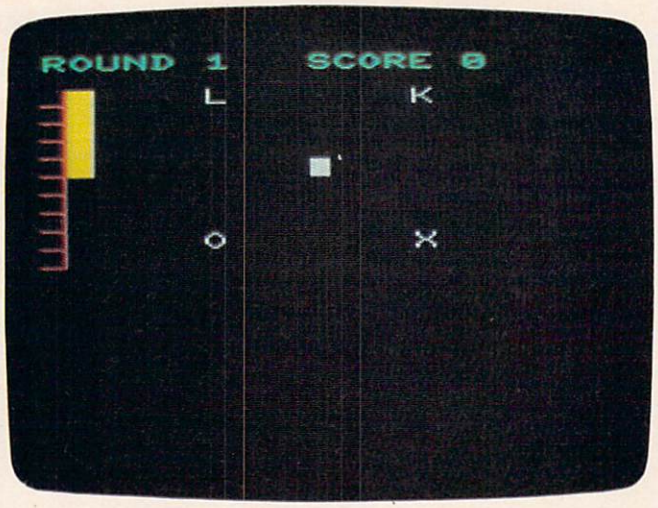

Round 1 is underway in the VIC version of "Alpha Blast."

```
140 NEXT:IFN(0)=32ANDN(1)=32ANDN(2)=32AND
    N(3)=32THEN30
150 IFPEEK(162)>TTTHENPOKE36877,200:POKE1
    62,0:POKE7681+T*22,32:T=T-1:POKE36877
    ,0
160 GOTO110
170 IFNU=32THEN110
180 POKE36877,200:L=7822+D(I):FORJ=1TO4:P
    OKEL,174:FORW=1TO10:NEXT:POKEL,160
190 L=L+D(I):POKE36878,15-J*3:NEXT:POKEL-
    D(I),160:N(I)=32:POKE36877,0:POKE3687
    8,15
200 IFLA<NUTHEN230
210 SC=SC-NU:PRINT"{HOME}{RVS}{GRN}"SPC(1
    5)SC
220 POKE36875,230:FORW=1TO250:NEXT:POKE36
    875,0:FORW=1TO500:NEXT:GOTO30
230 LA=NU:SC=SC+NU:PRINT"{HOME}{RVS}{GRN}
    "SPC(15)SC:GOTO110
240 PRINT"{CLR}";:POKE36879,8:POKE36877,0
    :POKE36878,15:FORI=1TO75
250 POKE7680+RND(1)*506,RND(1)*26+1
260 POKE36874,I+180:NEXT:POKE36874,0
270 FORW=1TO50:NEXT
280 POKE214,9:PRINT:PRINTSPC(5)"{GRN}----
    ----------":PRINT:PRINTSPC(5)"---------
    ---"
290 PRINTSPC(5)"{2 UP} ALPHABLAST "
300 FORI=7384TO7439:READA:POKEI,A:NEXT:FO
    RI=0TO3:READP(I),J(I),D(I):NEXT
310 POKE37154,127:PRINT"{CLR}":POKE36869,
    255:RETURN
320 PRINT"{CLR}{GRN}":FORS=250TO129STEP-1
    :POKE36875,S:NEXT:POKE36875,0:PRINTSP
    C(5)"{RVS}GAME OVER"
330 PRINT"{2 DOWN}{RVS}{3 SPACES}SCORE WA
    S"SC:IFSC>HITHENHI=SC
340 PRINT"{DOWN}{RVS} HIGH SCORE IS"HI
350 PRINT"{2 DOWN}{RVS}{2 SPACES}PRESS
    {WHT}FIRE{GRN} BUTTON"
360 IF(PEEK(37151)AND32)THEN360
370 GOTO20
380 DATA192,224,112,56,31,15,14,12, 12,14
    ,15,31,56,112,224,192
390 DATA3,7,14,28,248,240,112,48, 48,112,
    240,248,28,14,7,3
400 DATA126,126,126,126,126,126,126,126
410 DATA0,0,0,0,0,0,0,0,255,255,255,255,2
    55,255,255,255
420 DATA7730,353,-23,7906,349,21,7738,241
    ,-21,7914,237,23
```

Program 3: Alpha Blast – Color Computer

Version by Todd Koumrian, Programming Assistant

```
10 DIMA(156)
20 FORI=1TO156:READB:A(I)=B:NEXT
40 CLS0:PRINT@10,"ALPHA";:PRINT@16,
   "BLAST";
50 FORI=0TO4:FORJ=0TO2*I:SET(45-I+J
   ,10+I,3):SET(46+I,10+I,3):NEXT:N
   EXT
60 FORI=4TO0STEP-1:FORJ=0TO2*I:SET(
   45-I+J,15+4-I,3):SET(46+I,15+4-I
   ,3):NEXT:NEXT
70 FORI=0TO1:SET(42+I,11+I,8):SET(4
   9-I,11+I,8):SET(42+I,18-I,8):SET
   (49-I,18-I,8):NEXT
80 FORI=1034TO1044:POKEI,32:NEXT
90 PRINT@10,"ROUND";:PRINT@19,"SCOR
   E";
99 SC=0:TM=9
100 FORI=8TO25STEP2:SET(0,I,8):NEXT
    :BL=10:QQ=0:FORI=1TO4:TT(I)=0:N
    EXT:TI=0:LM=0
110 N(1)=RND(26)
120 N(2)=RND(26):IFN(2)=N(1)THEN120
130 N(3)=RND(26):IFN(3)=N(1)ORN(3)=
    N(2)THEN130
140 N(4)=RND(26):IFN(4)=N(1)ORN(4)=
    N(2)ORN(4)=N(3)THEN140
150 FORI=1TO4:S(I)=(N(I)-1)*6+1:NEX
    T:GOSUB200:GOSUB210:GOSUB220:GO
    SUB230
160 R=R+1:R$=STR$(R):FORI=2TOLEN(R$
    ):RQ$=MID$(R$,I,1):POKE1038+I,V
    AL(RQ$)+48:NEXT
162 IFR/3=INT(R/3)THENTM=TM-1
165 GOTO300
200 FORI=0TO5:CR(I)=A(I+S(1))+144:N
    EXT
205 FORI=0TO5:PRINT@(32*INT((I/2)+1
    )+(I AND 1))+16,CHR$(CR(I));:NE
    XT:RETURN
210 FORI=0TO5:CR(I)=A(I+S(2))+208:N
    EXT
215 FORI=0TO5:PRINT@(32*INT((I/2)+1
    )+(I AND 1))+28,CHR$(CR(I));:NE
    XT:RETURN
220 FORI=0TO5:CR(I)=A(I+S(3))+224:N
    EXT
225 FORI=0TO5:PRINT@(32*INT((I/2)+1
    3)+(I AND 1))+16,CHR$(CR(I));:N
    EXT:RETURN
230 FORI=0TO5:CR(I)=A(I+S(4))+192:N
    EXT
235 FORI=0TO5:PRINT@(32*INT((I/2)+1
    3)+(I AND 1))+28,CHR$(CR(I));:N
    EXT:RETURN
300 X=JOYSTK(0):Y=JOYSTK(1)
310 IFX<8ANDY<8THENT=1:GOTO370
320 IFX>55ANDY<8THENT=2:GOTO370
330 IFX<8ANDY>55THENT=3:GOTO370
340 IFX>55ANDY>55THENT=4:GOTO370
350 TI=TI+1:IF TI<TM THEN300
351 BL=BL-1:IFBL=0THEN1000
352 RESET(0,2*(BL-1)+8):TI=0:SOUND1
    ,1:GOTO350
370 IFTT(T)=1THEN350
380 FORI=0TO5:CR(I)=128:NEXT
```

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```
385 NM=N(T):IF LM< NM THEN387
386 SC=SC-(NM+96):GOTO390
387 SC=SC+NM+96:LM=NM
390 ON T GOSUB400,410,420,430
395 LC=1048:GOSUB2000
396 IFLM> NM THENGOSUB205:GOSUB215:
    GOSUB225:GOSUB235:FORI=1TO4:TT(
    I)=1:NEXT
397 FORI=1TO4:QQ=QQ+TT(I):NEXT:IFQQ
    =4THEN100
398 QQ=0:GOTO350
400 FORI=41TO35STEP-1:SET(I,I-31,3)
    :NEXT:FORI=41TO35STEP-1:RESET(I
    ,I-31):NEXT:GOSUB205:GOTO440
410 FORI=50TO56:SET(I,60-I,3):NEXT:
    FORI=50TO56:RESET(I,60-I):NEXT:
    GOSUB215:GOTO440
420 FORI=41TO33STEP-1:SET(I,60-I,3)
    :NEXT:FORI=41TO33STEP-1:RESET(I
    ,60-I):NEXT:GOSUB225:GOTO440
430 FORI=50TO58:SET(I,I-31,3):NEXT:
    FORI=50TO58:RESET(I,I-31):NEXT:
    GOSUB235
440 TT(T)=1:T=0:F=0:RETURN
1000 CLS0:PRINT@46,"GAME";:PRINT@51
     ,"OVER";:PRINT@105,"YOUR";:PRI
     NT@110,"SCORE";:PRINT@116,"WAS
     ";
1010 LC=1142:GOSUB2000
1011 GOTO1011
2000 SC$=STR$(SC):FORI=2TOLEN(SC$):
     DD$=MID$(SC$,I,1):POKELC+I,VAL
     (DD$)+48:NEXT:POKELC+I,32:POKE
     LC+I+1,32:RETURN
10000 DATA 6,9,11,7,8,4,14,9,14,13,
      12,8,14,12,10,0,12,12,14,9,10
      ,5,12,8,14,12,14,8,12,12
10010 DATA 14,12,14,8,8,0,14,8,10,1
      3,12,12,10,5,14,13,8,4,13,14,
      5,10,12,12,4,14,2,10,4,8,10,6
      ,14,2,8,4
10020 DATA 10,0,10,0,12,12,9,6,10,5
      ,8,4,15,5,10,15,8,4,14,13,10,
      5,12,12,14,13,14,12,8,0
10030 DATA 14,13,10,6,12,4,14,13,14
      ,9,8,4,14,12,12,13,12,12,13,1
      4,5,10,4,8,10,5,10,5,12,12
10040 DATA 10,5,9,6,4,8,10,5,9,6,8,
      4,10,5,6,9,8,4,9,6,5,10,4,8,1
      2,14,6,0,12,12
```

Program 4: Alpha Blast – TI-99/4A

Extended BASIC Version by Pat Parrish, Programming Supervisor

```
100 GOSUB 510
110 RANDOMIZE
120 DIM N(3)
130 CALL CLEAR :: CALL SCREEN(16)
140 CALL HCHAR(8,5,120,24):: DISPLA
    Y AT(10,4):"A L P H A -- B L A
    S T" :: CALL HCHAR(12,5,120,24)
150 CALL MAGNIFY(2):: FOR L=1 TO 28
160 CALL SPRITE(#L,INT(RND*26)+65,I
    NT(RND*13)+3,INT(RND*24)*8+1,IN
    T(RND*32)*8+1,INT(RND*60)-30,IN
    T(RND*60)-30)
170 IF L=25 THEN DISPLAY AT(21,10):
    "GET READY!"
```

TI-99/4A Version Notes

Pat Parrish, Programming Supervisor

The object of the TI-99/4A version of Alpha Blast (written in Extended BASIC) is to indicate within a certain time the alphabetical order of four scrambled letters appearing on the screen. In its present form, the game requires a joystick. Moving the joystick in the direction of any letter will cause that letter to disappear. At the same time, the order of this response is recorded.

After you have guessed the sequence of the first four letters, a new round begins with the appearance of four new letters. As the game continues, you are given less and less time to respond. The game ends when you can no longer provide four responses within the allotted time.

Scoring for the game is calculated in lines 470 and 480. It is based on three factors: the round number, the time that it took you to respond, and the order of your answers. The faster you can provide the correct answers, the higher will be your score. For an incorrect response, points are deducted at a rate one and a half times the number awarded for correct answers.

To convert this game to keyboard control, substitute the following lines:

```
330 CALL KEY(0,X,ST):: IF ST=0 THEN
     CALL HCHAR(ROW,6,32):: ROW=ROW
    -U :: IF ROW<5 THEN 400 ELSE 33
    0
340 IF (X=69)*(A)THEN CALL PATTERN(
    #2,32,#6,43):: V(T)=0 :: A=0 ::
     GOTO 390
350 IF (X=68)*(B)THEN CALL PATTERN(
    #3,32,#6,43):: V(T)=1 :: B=0 ::
     GOTO 390
360 IF (X=88)*(C)THEN CALL PATTERN(
    #4,32,#6,43):: V(T)=2 :: C=0 ::
     GOTO 390
370 IF (X=83)*(D)THEN CALL PATTERN(
    #5,32,#6,43):: V(T)=3 :: D=0 ::
     GOTO 390
```

```
180 NEXT L :: CALL DELSPRITE(ALL)::
     CALL CLEAR :: HS=0
190 CALL COLOR(12,6,1)
200 DISPLAY AT(1,6):"HIGH SCORE:";H
    S :: U=0 :: R=0 :: SC=0
210 U=U+.03*SGN(1-U):: R=R+1 :: DIS
    PLAY AT(5,14):"ROUND #";R :: DI
    SPLAY AT(2,6):"SCORE:
    {5 SPACES}";SC
220 FOR I=6 TO 21 :: CALL HCHAR(I,6
    ,128):: NEXT I
230 FOR I=5 TO 7 STEP 2 :: CALL VCH
    AR(5,I,95,17):: NEXT I
240 FOR I=3 TO 9 STEP 6 :: CALL VCH
    AR(4,I,120,20):: NEXT I :: CALL
```

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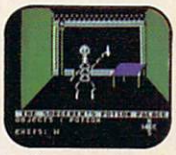
And with over ninety different screens and two full sides of play, those obstacles and the decisions you must make can appear endless. In fact, you may have to endure hours of searching to rescue Gwendolyn.

But for her, you would endure anything, wouldn't you?

Gwendolyn—a non-violent, intermediate graphic adventure game, written by Marc Russell Benioff, Atari 40K Disk $27.95, Artworx Software Co., Inc., 150 N. Main St., Fairport, N.Y. 14450. For a free catalog of Artworx Software for the Atari, Apple, VIC-20 & Commodore 64 computers, write or call 800-828-6573.



These are just three of over ninety exciting screens.

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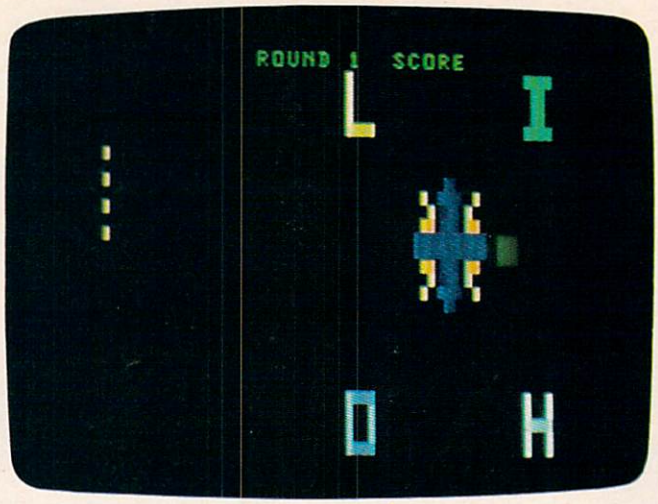

TI version of "Alpha Blast."

```
     HCHAR(4,4,120,5):: CALL HCHAR(
    23,4,120,5)
250 FOR I=0 TO 3
260 N(I)=INT(RND*26)+65
270 FOR J=0 TO I-1 :: IF N(J)=N(I)T
    HEN 260
280 NEXT J :: NEXT I
290 CALL SPRITE(#6,42,3,97,153)
300 CALL SPRITE(#2,N(0),14,57,153):
    : CALL SPRITE(#3,N(1),14,97,201
    ):: CALL SPRITE(#4,N(2),14,137,
    153):: CALL SPRITE(#5,N(3),14,9
    7,105)
310 ROW=21 :: A=-1 :: B=-1 :: C=-1
    :: D=-1
320 T=0
330 CALL JOYST(1,X,Y):: IF ABS(X)+A
    BS(Y)<>4 THEN CALL HCHAR(ROW,6,
    32):: ROW=ROW-U :: IF ROW<5 THE
    N 400 ELSE 330
340 IF (X=0)*(Y=4)*(A)THEN CALL PAT
    TERN(#2,32,#6,43):: V(T)=0 :: A
    =0 :: GOTO 390
350 IF (X=4)*(Y=0)*(B)THEN CALL PAT
    TERN(#3,32,#6,43):: V(T)=1 :: B
    =0 :: GOTO 390
360 IF (X=0)*(Y=-4)*(C)THEN CALL PA
    TTERN(#4,32,#6,43):: V(T)=2 ::
    C=0 :: GOTO 390
370 IF (X=-4)*(Y=0)*(D)THEN CALL PA
    TTERN(#5,32,#6,43):: V(T)=3 ::
    D=0 :: GOTO 390
380 CALL HCHAR(ROW,6,32):: ROW=ROW-
    U :: IF ROW<5 THEN 400 ELSE 330
390 CALL SOUND(-10,200,2):: CALL PA
    TTERN(#6,42):: T=T+1 :: IF T=4
    THEN 450 ELSE 330

400 DISPLAY AT(22,11):"YOUR TIME IS
     UP!"
410 CALL SOUND(800,110,5,120,5):: F
    OR I=1 TO 200 :: NEXT I
420 DISPLAY AT(24,10):"PLAY AGAIN(Y
    /N)?" :: IF SC>HS THEN HS=SC
430 CALL KEY(0,KEY,ST):: IF ST=0 TH
    EN 430
440 IF (KEY=89)+(KEY=121)THEN CALL
    CLEAR :: CALL DELSPRITE(ALL)::
    GOTO 200 ELSE 560

450 REM EVALUATE ANSWERS
460 FOR T=0 TO 2 :: IF N(V(T))<N(V(
    T+1))THEN 480
470 SC=SC-INT(1.5*R*ROW):: GOTO 490
480 SC=SC+INT(R*ROW)
490 NEXT T
500 CALL DELSPRITE(ALL):: GOTO 210
510 REM CHAR
520 CALL COLOR(14,9,1)
530 CALL CHAR(120,"007E7E7E7E7E7E00
    "):: CALL CHAR(128,"")
540 CALL COLOR(12,6,10):: CALL COLO
    R(13,1,9)
550 RETURN
560 END
```

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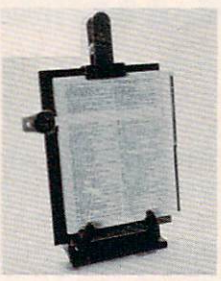

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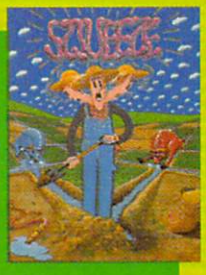
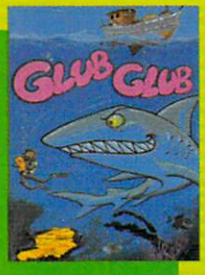
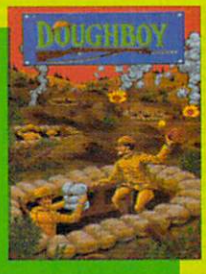
SQUEEZE
The fields are dry. You hafta dig a heap o' ditches! But you better be nimble 'cause the bulls they gonna chase you down. So pick up your shovel and start diggin' your way to fun and fast action!

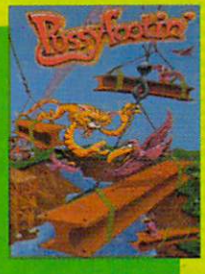




GLUB GLUB
The map was right! Under the boat the unmistakable glitter of gold. A king's ransom! But those dark forms can only be...sharks! Can you conquer your fear and avoid those dark marauders?

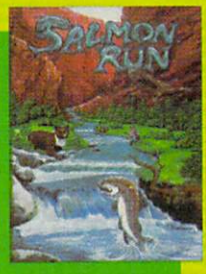
DOUGHBOY
The bugle call has sounded. It's time to hit the trenches for a fun-filled contest of bravery and tactics. Your mission: Recover the supplies that are scattered across the playfield while avoiding enemy troops.





PUSSYFOOTIN'
Meet Fearless Franklin the guard cat. His job: catching nasty grustlebirds and keeping things running smoothly for his hard hat buddies. But won't anything stand still?

SALMON RUN
Sammy the seafaring salmon is back to see his fishy fiancé. But he has to meet her upstream and there are waterfalls, hungry bears, anglers and bothersome birds at every bend. But Sammy is determined to give you hours of fishy fun!



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PATHWAY

George Trepal

"Pathway" is not a typical computer game. The computer is not an opponent – it simply keeps track of the game you play against another person. For VIC, 64, and Apple.

The rules of the game are simple, but there are a few catches. Each player (two or three can play) starts off with four tokens at the start of a path. The first player to get all four tokens to the end of the path is the winner.

To play, push the VIC's F7 key. The machine will return the number of spaces you can move. Each token is numbered 1, 2, 3, or 4. Press the appropriate number key for the token you want moved. If your token lands on another player's token, that token is sent back to the start of the path. If you land on your own token, that token becomes invisible until it is moved. As you play, you'll see that a wise strategy is required to win.

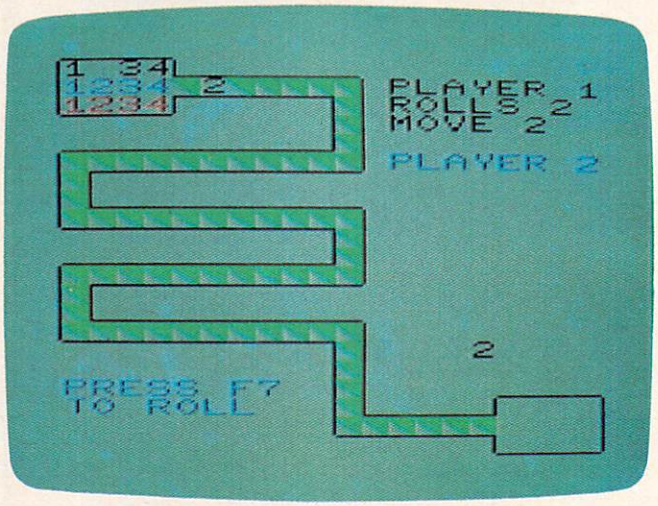
The VIC version is written for the unmodified VIC, so disconnect any extra memory (except for the Super Expander).

Game Movement Logic

The positions of the tokens are stored in arrays and updated as the tokens are moved. Once a move is made, the arrays are compared to see if a token should be sent back to the start. The position of a token is a number which represents how many cells away the token is located from the start of the path.

Each cell corresponds to a certain screen location, all of which are stored in DATA statements. For example, if a token were moved from cell 24 to cell 31, the machine would read the DATA from the start and put a path character in position 24 to erase the token. It would then return to the start of DATA and read to the thirty-first location, where the token is then printed to the screen.

The 64 version is almost identical in play to the VIC version, although the playing field is larger. The Apple version uses the space bar instead of the F7 key used by the Commodore versions.



Player 2 is about to roll the dice in the VIC version of "Pathway."

If you'd rather not type in the program (VIC version only), send $3, a blank tape or disk, and an SASE to:

George Trepal
2650 Alturas Road
Bartow, FL 33830

BEFORE TYPING...

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

Program 1: Pathway For VIC

```
1 D$="{HOME}{12 DOWN}":CC=3072Ø:E$="
  {HOME}{7 DOWN}":POKE36879,25
2 DIMA$(23)
3 PRINT"{CLR}{BLK}{5 DOWN}{2 SPACES}2 OR
   3 PLAYERS";:GOSUB88:IFM<>2ANDM<>3THEN
  3
4 P=M:PRINT"{CLR}":GOSUB56:GOSUB5Ø
5 VO=36878:TN=36875
6 FORJ=1TO4:POKE38834+J,Ø:POKE38856+J,6:
  POKE38878+J,2:NEXT
7 PRINTD$+"{8 DOWN}{8 SPACES}";
8 DEFFNA(X)=INT(RND(1)*9)+1
```

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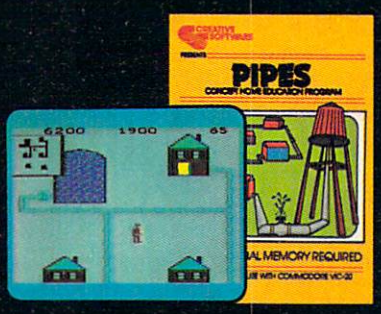
```
9 FORJ=1TO4:AA(J)=7702+J:POKEAA(J),48+J:
  POKEAA(J)+CC,0:NEXTJ
10 FORJ=1TO4:BB(J)=7724+J:POKEBB(J),48+J
   :POKEBB(J)+CC,6:NEXTJ
11 FORJ=1TO4:CC(J)=7746+J:POKECC(J),48+J
   :POKECC(J)+CC,2:NEXTJ
12 GOSUB87:PRINT"{HOME}{2 DOWN}{BLK}"SPC
   (13)"PLAYER 1";
13 POKE7765,32:POKE7786,32
14 GOSUB77:PRINT"{HOME}{3 DOWN}{BLK}"SPC
   (13)"ROLLS";V
15 PRINT"{HOME}{4 DOWN}"SPC(13)"MOVE";
16 GOSUB88:IFM<1ORM>4THEN15
17 PRINTM:IFA(M)=0THENPOKEAA(M),32
18 IFA(M)>0THENCV=A(M):GOSUB84
19 IFV+A(M)>70THENPOKE8114+M,48+M:A(M)=7
   1:GOTO24
20 A(M)=A(M)+V:RESTORE:FORJ=1TOA(M):READ
   X:NEXT:POKEX,M+48:POKEX+CC,0
21 FORJ=1TO4:IFB(J)<>0ANDB(J)=A(M)THENB(
   J)=0:POKEBB(J),48+J:GOSUB86
22 NEXT:FORJ=1TO4:IFC(J)<>0ANDC(J)=A(M)T
   HENC(J)=0:POKECC(J),48+J:GOSUB86
23 NEXT
24 GOSUB87:PRINT"{HOME}{6 DOWN}{BLU}"SPC
   (13)"PLAYER 2";
25 POKE7853,32:POKE7874,32
26 GOSUB77:PRINTE$SPC(13)"ROLLS";V
27 PRINTE$SPC(13)"{DOWN}MOVE";
28 GOSUB88:IFM<1ORM>4THEN27
29 PRINTM:IFB(M)=0THENPOKEBB(M),32
30 IFB(M)>0THENCV=B(M):GOSUB84
31 IFV+B(M)>70THENPOKE8136+M,48+M:B(M)=7
   1:GOTO36
32 B(M)=B(M)+V:RESTORE:FORJ=1TOB(M):READ
   X:NEXT:POKEX,M+48:POKEX+CC,6
33 FORJ=1TO4:IFA(J)<>0ANDA(J)=B(M)THENA(
   J)=0:POKEAA(J),48+J:GOSUB86
34 NEXT:FORJ=1TO4:IFC(J)<>0ANDC(J)=B(M)T
   HENC(J)=0:POKECC(J),48+J:GOSUB86
35 NEXTJ
36 IFP<>3THEN12
37 GOSUB87:PRINTE$+"{3 DOWN}{RED}"SPC(13
   )"PLAYER 3"
38 POKE7941,32:POKE7962,32
39 GOSUB77:PRINTE$+"{4 DOWN}"SPC(13)"ROL
   LS";V
40 PRINTD$SPC(13)"MOVE";
41 GOSUB88:IFM<1ORM>4THEN40
42 PRINTM:IFC(M)=0THENPOKECC(M),32
43 IFC(M)>0THENCV=C(M):GOSUB84
44 IFV+C(M)>70THENPOKE8158+M,48+M:C(M)=7
   1:GOTO12
45 C(M)=C(M)+V:RESTORE:FORJ=1TOC(M):READ
   X:NEXTJ:POKEX,M+48:POKEX+CC,2
46 FORJ=1TO4:IFA(J)<>0ANDA(J)=C(M)THENA(
   J)=0:POKEAA(J),48+J:GOSUB86
47 NEXT:FORJ=1TO4:IFB(J)<>0ANDB(J)=C(M)T
   HENB(J)=0:POKEBB(J),48+J:GOSUB86
48 NEXT:GOTO12
49 GOTO49
50 DATA7729,7730,7731,7732,7733,7734,773
   5,7757,7779,7801,7823,7822,7821,7820,
   7819,7818
51 DATA7817,7816,7815,7814,7813,7835,785
   7,7879,7880,7881,7882,7883,7884,7885,
   7886,7887
52 DATA7888,7889,7911,7933,7955,7954,795
   3,7952,7951,7950,7949,7948,7947,7946,
   7945,7967
53 DATA7989,8011,8012,8013,8014,8015,801
   6,8017,8018,8019,8020,8021,8043,8065,
   8087,8109
54 DATA8131,8132,8133,8134,8135,8136
55 FORJ=1TO70:READX:POKEX,95:POKEX+CC,5:
   NEXTJ:RESTORE:RETURN
56 A$(1)=" {4 @}"
57 A$(2)="{M}{4 SPACES}L{6 @}"
58 A$(3)="{M}{11 SPACES}{G}"
59 A$(4)="{M}{4 SPACES}O{4 T}P {G}"
60 A$(5)=" {4 T}{5 SPACES}{M} {G}"
61 A$(6)=" {9 @}@ {G}"
62 A$(7)="{M}{11 SPACES}{G}"
63 A$(8)="{M} O{9 T}"
64 A$(9)="{M} L{9 @}"
65 A$(10)=A$(7)
66 A$(11)=" {9 T}P {G}"
67 A$(12)=" {9 @}@ {G}"
68 A$(13)=A$(7)
69 A$(14)=A$(8):A$(15)=A$(9):A$(16)=A$(1
   0):A$(17)=A$(11)
70 A$(18)="{10 SPACES}{M} {G}"
71 A$(19)="{10 SPACES}{M} {G}
   {4 SPACES}{4 @}"
72 A$(20)="{10 SPACES}{M} L{3 @}@
   {4 SPACES}{G}"
73 A$(21)="{10 SPACES}{M}{10 SPACES}
   {G}"
74 A$(22)="{11 SPACES}{5 T}P{4 SPACES}
   {G}"
75 A$(23)="{17 SPACES}{4 T}"
76 FORJ=1TO19:PRINTA$(J):NEXT:FORJ=20TO2
   3:PRINTA$(J);:NEXT:RETURN
77 PRINTD$+"{6 DOWN} PRESS F7";
78 PRINTD$+"{7 DOWN} TO ROLL";
79 IFPEEK(197)=63THEN81
80 GOTO79
81 V=FNA(1):POKE198,0
82 FORJ=1TOV:POKE8048,48+J:POKE38768,0:F
   ORT=1TO100:NEXT:POKEVO,15:POKETN,200:
   POKEVO,0
83 NEXT:RETURN
84 IFCV>70THENCV=70
85 RESTORE:FORJ=1TOCV:READX:NEXT:POKEX,9
   5:POKEX+CC,5:RETURN
86 POKEVO,15:POKETN,250:FORT=1TO700:NEXT
   :POKEVO,0:RETURN
87 POKEVO,10:POKETN,128:FORT=1TO200:NEXT
   :POKEVO,0:RETURN
88 GETM$:ON-(M$="")GOTO88:M=VAL(M$):RETU
   RN
```

Program 2: Pathway For The 64

```
100 D$="{HOME}{12 DOWN}":CC=54272:E$="
    {HOME}{7 DOWN}":POKE53281,1:POKE53280
    ,14:SO=CC
110 DIMA$(23):FORT=SOTOSO+24:POKET,0:NEXT
    :POKESO+24,15:POKESO+5,34:POKESO+6,24
    4
115 PRINT"{CLR}{7 DOWN}{15 RIGHT}PATHWAYS
    "
120 PRINT"{BLK}{4 DOWN}{10 RIGHT}
    {2 SPACES}2 OR 3 PLAYERS";
125 GOSUB960:IFM<>2ANDM<>3THEN125
130 P=M:PRINT"{CLR}":GOSUB650:GOSUB590
140 VO=36878:TN=36875
150 FORJ=1TO4:POKE1104+CC+J,0:POKE1144+CC
    +J,6:POKE1184+CC+J,2:NEXT
```

HELP WANTED:



Arlo is a hard-working plumber, but a touch absent-minded. He's building a water supply system for the whole neighborhood, and he really has his hands full. Help Arlo decide what kind of pipe to buy and where to put it... his limited budget doesn't leave him much margin for error. Figure out the shortest, most economical way to get everyone hooked up... and just hope poor Arlo has remembered to open and close the right valves. A marvelously entertaining and challenging exercise in planning, economics and spatial relationships for all ages.

PIPES. For the VIC-20 and Commodore 64.

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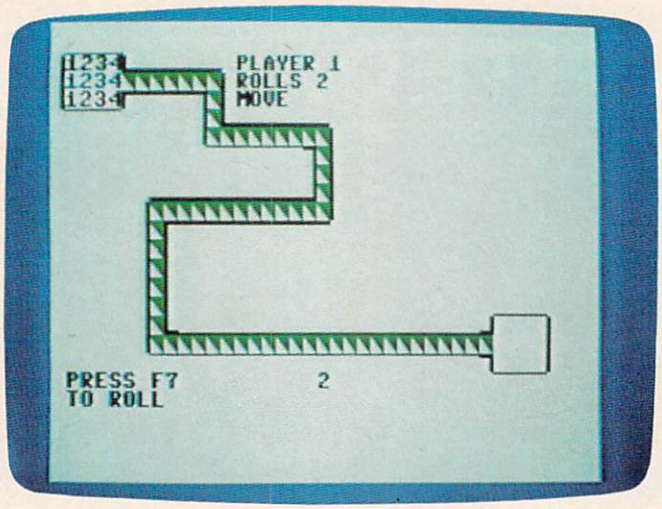

64 version of "Pathway."

```
160 PRINTD$+"{8 DOWN}{8 SPACES}";
170 DEFFNA(X)=INT(RND(1)*9)+1
180 FORJ=1TO4:AA(J)=1104+J:POKEAA(J),48+J
    :POKEAA(J)+CC,0:NEXTJ
190 FORJ=1TO4:BB(J)=1144+J:POKEBB(J),48+J
    :POKEBB(J)+CC,6:NEXTJ
200 FORJ=1TO4:CC(J)=1184+J:POKECC(J),48+J
    :POKECC(J)+CC,2:NEXTJ
210 GOSUB950:PRINT"{HOME}{2 DOWN}{BLK}"SP
    C(13)"PLAYER 1";
220 POKE1163,32:POKE1163+CC,0:POKE1202,32
    :POKE1202+CC,0
230 GOSUB850:PRINT"{HOME}{3 DOWN}{BLK}"SP
    C(13)"ROLLS";V
240 PRINT"{HOME}{4 DOWN}{BLK}"SPC(13)"MOV
    E";
250 GOSUB960:IFM<10RM>4THEN240
260 PRINTM:IFA(M)=0THENPOKEAA(M),32
270 IFA(M)>0THENCV=A(M):GOSUB920
280 IFV+A(M)>65THENPOKE1695+M,48+M:POKE16
    95+M+CC,0:A(M)=66:GOTO330
290 A(M)=A(M)+V:RESTORE:FORJ=1TOA(M):READ
    X:NEXT:POKEX,M+48:POKEX+CC,0
300 FORJ=1TO4:IFB(J)<>0ANDB(J)=A(M)THENB(
    J)=0:POKEBB(J),48+J:GOSUB940
310 NEXT:FORJ=1TO4:IFC(J)<>0ANDC(J)=A(M)T
    HENC(J)=0:POKECC(J),48+J:GOSUB940
320 NEXT
330 GOSUB950:PRINT"{HOME}{2 DOWN}
    {10 RIGHT}{BLU}"SPC(13)"PLAYER 2";
340 POKE1173,32:POKE1173+CC,6:POKE1212,32
    :POKE1212+CC,6
350 GOSUB850:PRINT"{HOME}{3 DOWN}
    {10 RIGHT}{BLU}"SPC(13)"ROLLS";V
360 PRINT"{HOME}{4 DOWN}{10 RIGHT}"SPC(13
    )"MOVE";
370 GOSUB960:IFM<10RM>4THEN360
380 PRINTM:IFB(M)=0THENPOKEBB(M),32
390 IFB(M)>0THENCV=B(M):GOSUB920
400 IFV+B(M)>65THENPOKE1735+M,48+M:POKE17
    35+M+CC,6:B(M)=66:GOTO450
410 B(M)=B(M)+V:RESTORE:FORJ=1TOB(M):READ
    X:NEXT:POKEX,M+48:POKEX+CC,6
420 FORJ=1TO4:IFA(J)<>0ANDA(J)=B(M)THENA(
    J)=0:POKEAA(J),48+J:GOSUB940
430 NEXT:FORJ=1TO4:IFC(J)<>0ANDC(J)=B(M)T
    HENC(J)=0:POKECC(J),48+J:GOSUB940
440 NEXTJ
450 IFP<>3THEN210
460 GOSUB950:PRINT"{HOME}{2 DOWN}
    {19 RIGHT}{RED}"SPC(13)"PLAYER 3"
470 POKE1182,32:POKE1182+CC,2:POKE1221,32
    :POKE1221+CC,2
480 GOSUB850:PRINT"{HOME}{3 DOWN}
    {19 RIGHT}{RED}"SPC(13)"ROLLS";V
490 PRINT"{HOME}{4 DOWN}{19 RIGHT}{RED}"S
    PC(13)"MOVE";
500 GOSUB960:IFM<10RM>4THEN490
510 PRINTM:IFC(M)=0THENPOKECC(M),32
520 IFC(M)>0THENCV=C(M):GOSUB920
530 IFV+C(M)>65THENPOKE1775+M,48+M:POKE17
    75+M+CC,2:C(M)=66:GOTO210
540 C(M)=C(M)+V:RESTORE:FORJ=1TOC(M):READ
    X:NEXTJ:POKEX,M+48:POKEX+CC,2
550 FORJ=1TO4:IFA(J)<>0ANDA(J)=C(M)THENA(
    J)=0:POKEAA(J),48+J:GOSUB940
560 NEXT:FORJ=1TO4:IFB(J)<>0ANDB(J)=C(M)T
    HENB(J)=0:POKEBB(J),48+J:GOSUB940
570 NEXT:GOTO210
580 GOTO580
590 DATA 1149,1150,1151,1152,1153,1154,11
    55,1195,1235,1275,1276,1277,1278,1279
600 DATA1280,1281,1282,1283,1323,1363,140
    3,1443,1442,1441,1440,1439,1438,1437
610 DATA 1436,1435,1434,1433,1432,1431,14
    71,1511,1551,1591,1631,1671,1711,1712
620 DATA 1713,1714,1715,1716,1717,1718,17
    19,1720,1721,1722,1723,1724,1725
630 DATA 1726,1727,1728,1729,1730,1731,17
    32,1733,1734,1735
640 FORJ=1TO65:READX:POKEX,95:POKEX+CC,5:
    NEXTJ:RESTORE:RETURN
650 A$(1)=" {4 @}"
660 A$(2)="{M}{4 SPACES}L{6 P}"
670 A$(3)="{M}{11 SPACES}{G}"
680 A$(4)="{M}{4 SPACES}O{4 Y}P {G}
    "
690 A$(5)=" {4 T}{5 SPACES}{M} L
    {7 P}"
700 A$(6)="{10 SPACES}{N}{9 SPACES}
    {G}"
710 A$(7)="{11 SPACES}{7 T}P {G}"
720 A$(8)="{18 SPACES}{M} {H}"
730 A$(9)="{7 SPACES}{11 P}@ {H} "
740 A$(10)="{6 SPACES}{M}{13 SPACES}
    {G}"
750 A$(11)="{6 SPACES}{M} O{11 Y} "
760 A$(12)="{6 SPACES}{M} {G}"
770 A$(13)="{6 SPACES}{N} {H}
    {2 SPACES}"
780 A$(14)="{6 SPACES}{M} {G}"
790 A$(15)="{6 SPACES}{M} {G}
    {23 SPACES}{4 @}"
800 A$(16)="{6 SPACES}{M} L{22 @}@
    {4 SPACES}{G}"
810 A$(17)="{6 SPACES}{M}{29 SPACES}
    {G}"
820 A$(18)="{7 SPACES}{24 T}P{4 SPACES}
    {G}"
830 A$(19)="{32 SPACES}{4 T}"
840 FORJ=1TO19:PRINTA$(J):NEXT:PRINT"
    {HOME}":RETURN
850 PRINTD$+"{7 DOWN} PRESS F7";
860 PRINTD$+"{8 DOWN} TO ROLL";
870 IFPEEK(197)=3THEN890
880 GOSUB970:GOTO870
```

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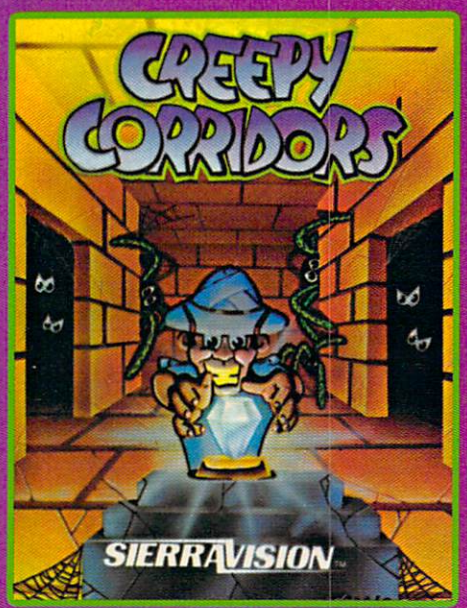

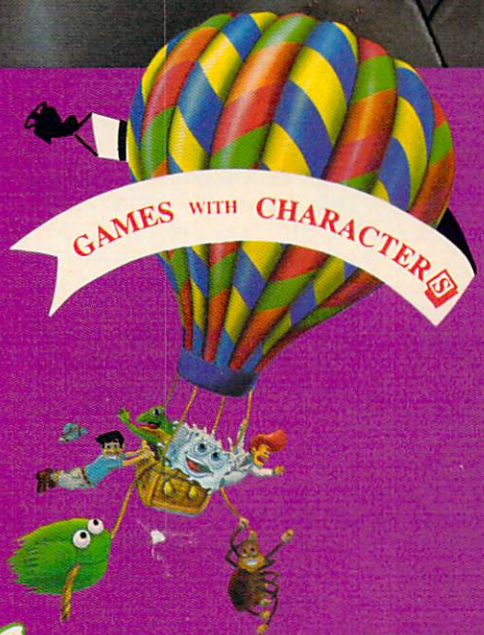

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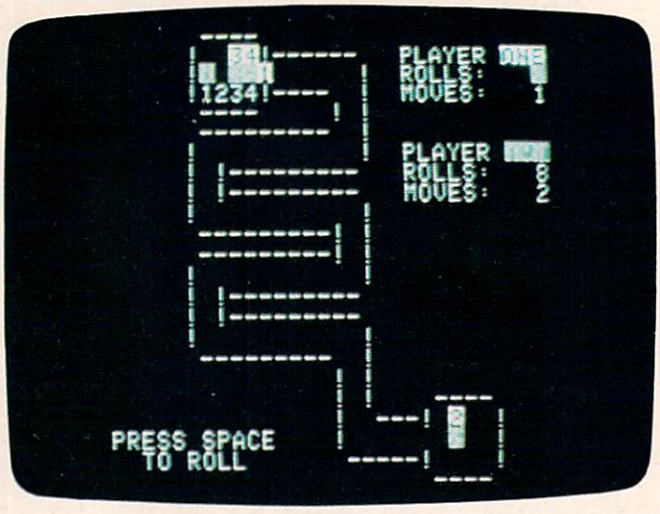
```
890 V=FNA(1):POKE198,0:POKESO+1,20
900 FORJ=1TOV:POKE1803,48+J:POKE1803+CC,0
    :POKESO+4,17:FORT=1TO10
910 POKESO+1,J*10:NEXT:NEXT:POKESO+4,16:R
    ETURN
920 IFCV>65THENCV=65
930 RESTORE:FORJ=1TOCV:READX:NEXT:POKEX,9
    5:POKEX+CC,5:RETURN
940 POKESO+1,10:POKESO+4,33:FORT=1TO700:N
    EXT:POKESO+4,32:RETURN
950 POKESO,80:POKESO+1,80:POKESO+4,33:FOR
    T=1TO200:NEXT:POKESO+4,32:RETURN
960 GETM$:ON-(M$="")GOTO960:M=VAL(M$):RET
    URN
970 D1=0:FORT=1696TO1699:Z1=PEEK(T):D1=Z1
    +D1:NEXT:IFD1=202THEN WI=1:GOTO1010
980 D2=0:FORT=1736TO1739:Z2=PEEK(T):D2=Z2
    +D2:NEXT:IFD2=202 THENWI=2:GOTO1010
990 D3=0:FORT=1776TO1779:Z3=PEEK(T):D3=Z3
    +D3:NEXT:IFD3=202 THENWI=3:GOTO1010
1000 RETURN
1010 PRINT"{CLR}{12 RIGHT}PLAYER";WI;" WI
     NS"
1020 PRINT"{2 DOWN}{10 RIGHT}PLAY AGAIN Y
      OR N ?"
1030 GET A$:IF A$<>"Y"AND A$<>"N"THEN1030
1040 IF A$="Y"THENRUN
```

Program 3: Pathway – Apple II Version

```
100  TEXT : HOME : VTAB 2: HTAB 16: INVERSE
     : PRINT "PATHWAY": NORMAL
110  VTAB 6: HTAB 8: PRINT "TWO OR THRE
     E PLAYERS? ";: GET A$:P =  VAL (A$
     ): IF P < 2 OR P > 3 THEN 110
120  DIM A$(23),P(70),A(3,4):GV =  - 16
     336: HOME : GOSUB 460
130  FOR I = 1 TO 70: READ P(I): NEXT
140 NM$(1) = "ONE":NM$(2) = "TWO":NM$(3
     ) = "THREE":OU(1) = 63:OU(2) = 127
     :OU(3) = 255
150  VTAB 2: HTAB 11: INVERSE : PRINT "
     1234": FLASH : HTAB 11: PRINT "123
     4": NORMAL : HTAB 11: PRINT "1234"
160  FOR I = 1 TO P: PRINT
170  VTAB 21: PRINT "    PRESS SPACE":
     HTAB 7: PRINT "TO ROLL"
180  VTAB (5 * I - 3): HTAB 25: PRINT "
     PLAYER ";: POKE 50,OU(I): PRINT NM
     $(I): NORMAL : HTAB 25: PRINT "ROL
     LS:     ";: HTAB 34
190  GET A$: IF A$ <  > " " THEN 190
200 V =  INT ( RND (1) * 9) + 1: FOR J =
     1 TO V: HTAB 34: PRINT J;: FOR K =
     1 TO 200: NEXT : NEXT
210  PRINT : VTAB 21: PRINT "    WHICH
     PIECE": HTAB 7: PRINT "TO MOVE"
220  VTAB (I * 5 - 1): HTAB 25: PRINT "
     MOVES:     ";: HTAB 34
230  GET A$:M =  VAL (A$): IF M < 1 OR
     M > 4 THEN 230
240  IF A(I,M) > 70 THEN 230
250  PRINT A$
260  IF A(I,M) = 0 THEN  POKE 1033 + 12
     8 * I + M,160: GOTO 290
270 QQ = 160: FOR K = 1 TO 4: IF A(I,K)
      = A(I,M) AND K <  > M THEN QQ = K
      + 64 * I - 16
280  NEXT : POKE P(A(I,M)),QQ
290 A(I,M) = A(I,M) + V: IF A(I,M) > 1
    THEN 350
300 A =  PEEK (P(A(I,M)))
310  IF A = 160 THEN 340
320  FOR J = 1 TO 3: FOR K = 1 TO 4: IF
     A(J,K) = A(I,M) AND J <  > I THEN
     A(J,K) = 0: POKE 1033 + 128 * J +
     K,A: PRINT  CHR$ (7) CHR$ (7);
330  NEXT : NEXT
340  PRINT  CHR$ (7);: POKE P(A(I,M)),M
      + 64 * I - 16: GOTO 400
350  POKE 1385 + M + I * 128,I * 64 + M
      - 16:C(I) = C(I) + 1: FOR K = 1 TO
     25:AG = AG +  PEEK (GV): NEXT : IF
     C(I) < 4 THEN 400
360  VTAB 17: HTAB 25: PRINT "PLAYER "N
     M$(I)"!": INVERSE : VTAB 21: HTAB
     5: PRINT "PRESS SPACE": HTAB 4:
     PRINT"TO PLAY AGAIN";: NORMAL
370  VTAB 7: HTAB 32
380  GET A$: IF A$ <  > " " THEN  HOME
     : END
390  RUN
400  NEXT : GOTO 160
410 :
420  DATA  1294,1295,1296,1297,1298,129
     9,1300,1428,1556,1684,1812,1811,18
     10,1809,1808,1807,1806,1805,1804,1
     803,1802
430  DATA  1930,1074,1202,1203,1204,120
     5,1206,1207,1208,1209,1210,1211,12
     12,1340,1468,1596,1595,1594,1593,1
     592,1591,1590,1589,1588,1587,1586
440  DATA  1714,1842,1970,1971,1972,197
     3,1974,1975,1976,1977,1978,1979,19
     80,1124,1252,1380,1508,1636,1637,1
     638,1639,1640,1641
450 :
460 A$(1) = " ----"
470 A$(2) = "!     !------"
480 A$(3) = "!           !"
490 A$(4) = "!     !----  !"
500 A$(5) = " ----     ! !"
510 A$(6) = " ---------  !"
520 A$(7) = "!           !"
530 A$(8) = "! !---------"
540 A$(9) = "! !---------"
550 A$(10) = A$(7)
560 A$(11) = " ---------! !"
```



Two game pieces have successfully traversed the maze in the Apple version of "Pathway."

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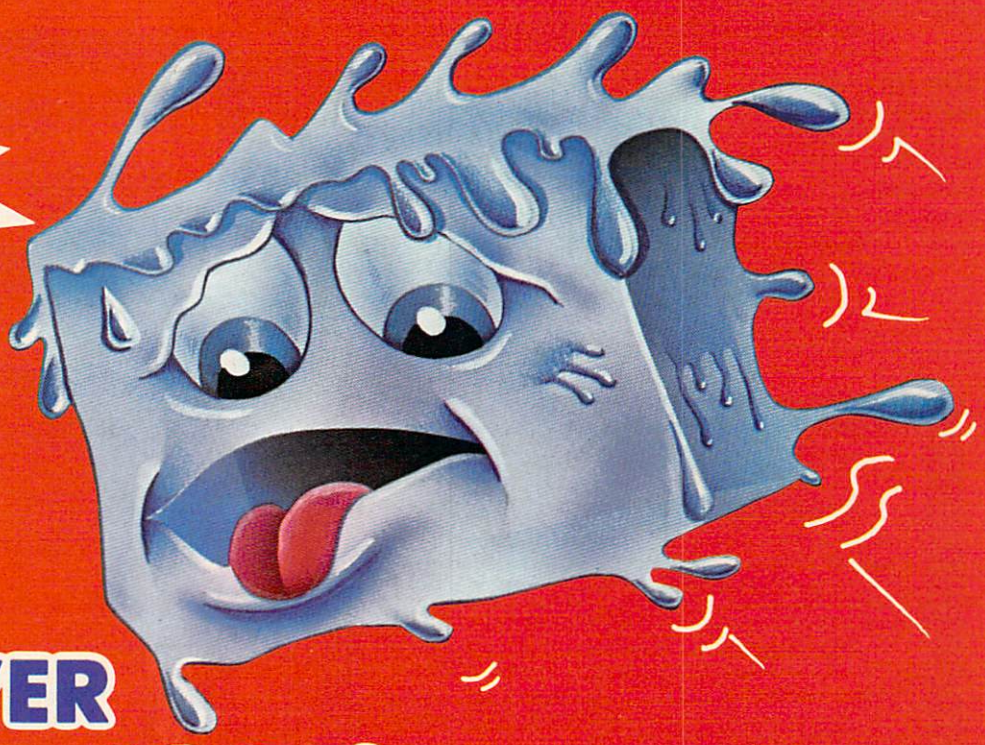

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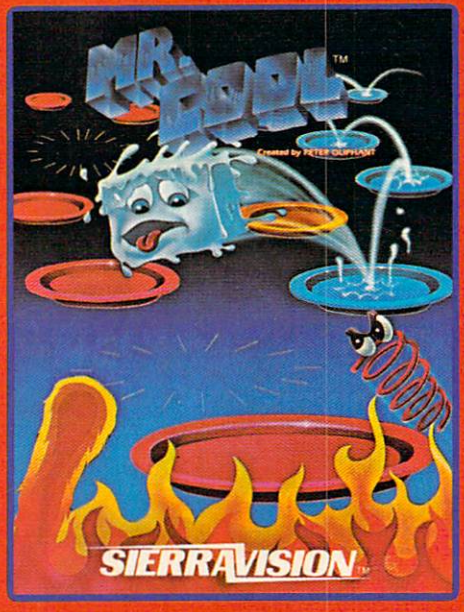

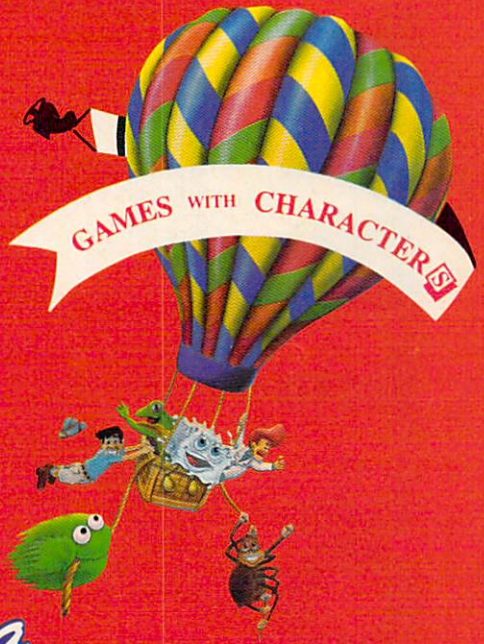

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```
570 A$(12) = "  ---------!  !"
580 A$(13) = A$(7):A$(14) = A$(8):A$(15
    ) = A$(9):A$(16) = A$(10):A$(17) =
    "  ---------   !"
590 A$(18) = "            !  !"
600 A$(19) = "            !  !     ----"
610 A$(20) = "            !   ---!     !"
620 A$(21) = "            !              !"
630 A$(22) = "             -----!     !"
640 A$(23) = "                  ----"
650  FOR J = 1 TO 23: HTAB 10: PRINT A$
    (J): NEXT : RETURN
```

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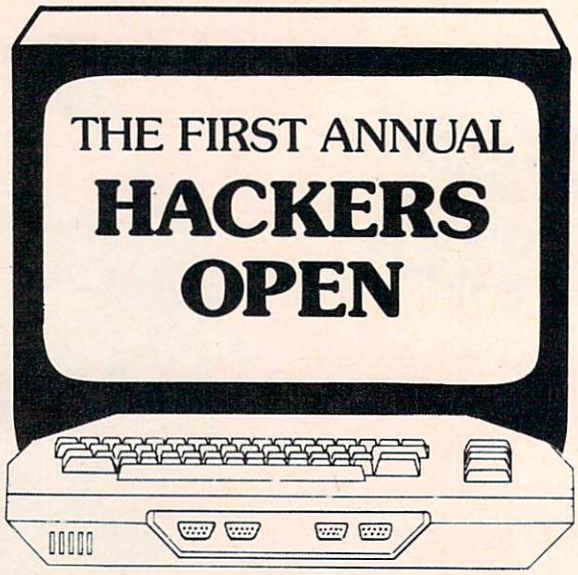

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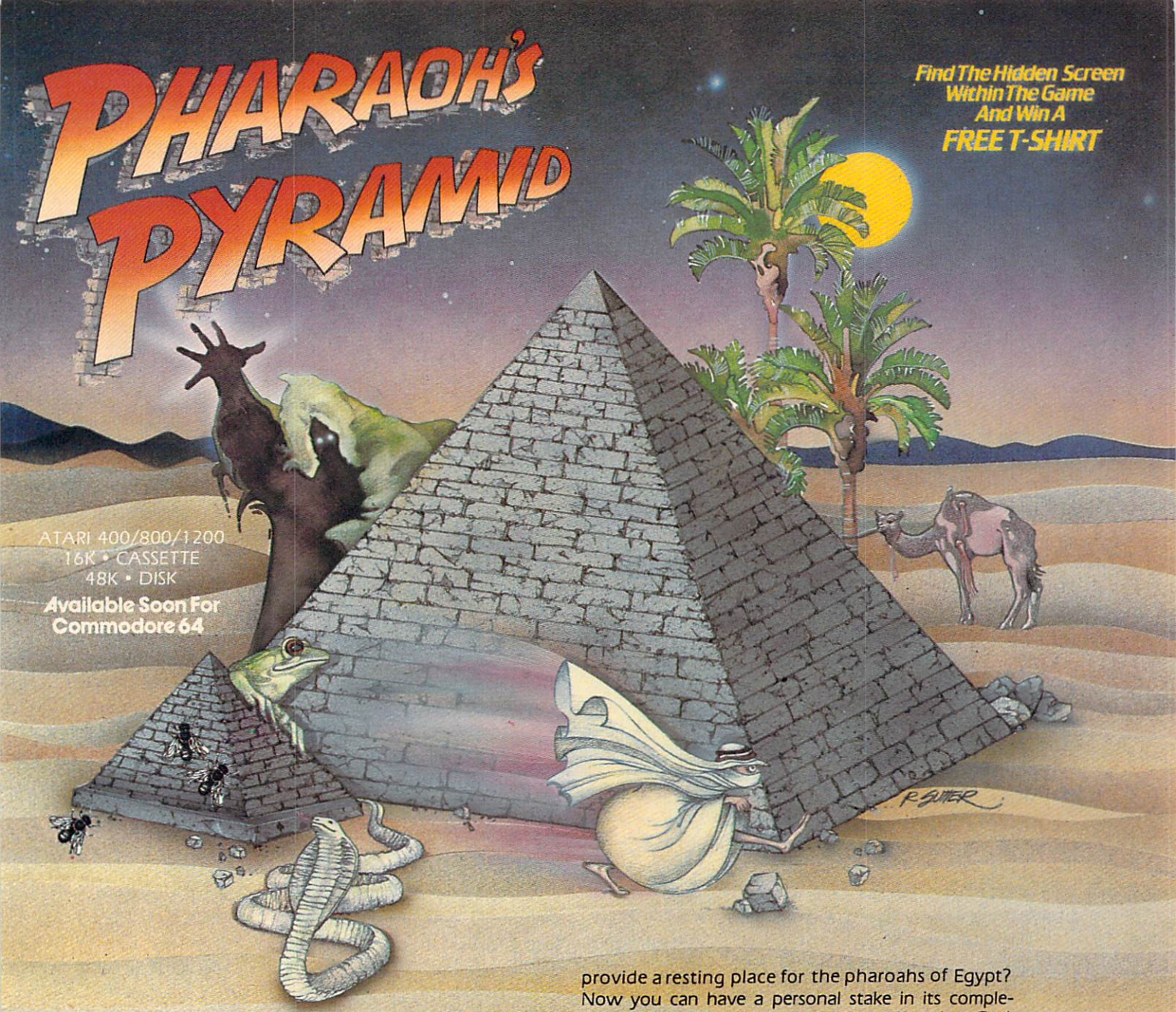

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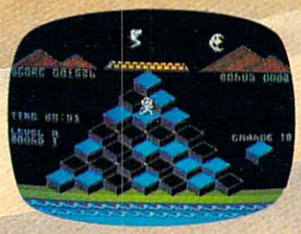

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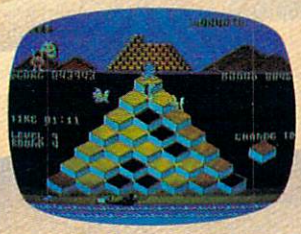

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Learning With Computers

Glenn M. Kleiman

The stack of new books and magazines on my desk fell over yesterday. I took that as a sign that I should write about some of them in this month's column. I've selected four publications that will be useful to many teachers, parents, and students. The first two concern educational software, and the other two are new dictionaries of computer terms. In future columns, I will review new books on Logo, teaching computer literacy, and other topics.

Courseware Report Card

Each issue of the *Courseware Report Card* contains comprehensive reviews, written by experienced educators, of a variety of educational software packages. All types of educational programs are reviewed, including drill-and-practice, tutorials, simulations, games, authoring systems, classroom management systems, and versions of Logo and turtle graphics. The programs are for Apple, Radio Shack, Atari, and Commodore computers.

Each review begins with a listing of the relevant subject areas, grade level, type of program, hardware requirements, price, and publisher's address. Then there is a brief summary of the program, followed by a very detailed description complete with pictures of the screen displays. Finally, there is an evaluation, divided into ratings of the program's overall performance and content, ease of use (for both students and teachers), error handling, appropriateness as a computer activity for students, documentation, and educational value. In each category, the program is given an A to F grade, and the reviewer explains why. A summary box displays the grades on each of the six criteria.

I find the reviews in the *Courseware Report Card* to be more useful than any others I have seen. I like having a description of the program separate from the evaluation, and the screen pictures help me get a better idea of how the program looks. I also like the fact that the reviewers explain the grade they give the program on each of the criteria, so you can determine whether you agree with their views. This is especially important for the appropriateness and educational value criteria, since educators disagree about the educational value of different activities and about which types of programs take best advantage of computers.

Courseware Report Card publishes two different sets of reviews – one for programs for elementary school students and the other for secondary school students. Each set can be purchased separately. Reviews are published five times during the school year, with at least 20 reviews each time. Each review is self-contained and three-hole punched, so you can conveniently file your copies by subject area, grade level, hardware compatibility, or however you choose.

Courseware Report Card is published by Educational Insights, Inc., 150 West Carob Street, Compton, CA 90220.

Courseware In The Classroom

Courseware in the Classroom: Selecting, Organizing and Using Educational Software, by Ann Lathrop and Bobby Goodson (published by Addison-Wesley, 1983), would be useful to anyone concerned with finding and evaluating educational software. This book is divided into six sections.

Section 1 presents an overview of how computers can be used in all areas of the curriculum.

Section 2 discusses six categories of software: (1) reinforcement and remediation (that is, drill-and-practice); (2) tutorials; (3) simulations and demonstrations; (4) problem-solving (for example, Logo, logic games); (5) program development aids (PILOT, shell games); and (6) tools for teachers (for example, classroom management and material preparation programs).

Section 3 focuses on criteria for evaluating courseware. The authors begin by discussing the most important general questions to ask: "Does the software meet specific instructional objectives?" and "Does it take good advantage of the computer's capabilities?" They emphasize that there is no point in using computers for activities that could be done just as well without them. They go on to discuss other criteria for content; screen formats; ease of use for students and

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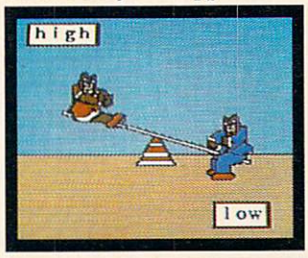

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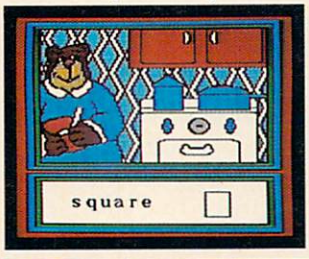

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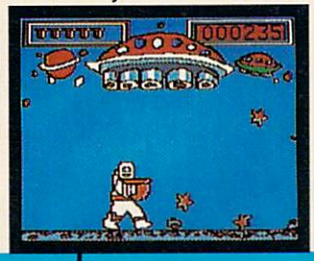

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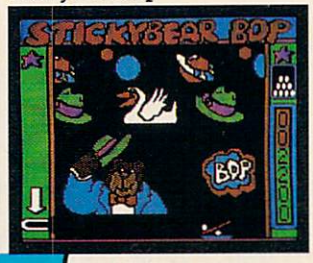

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teachers; types of feedback the program supplies; use of motivational devices such as graphics, sound, and competition; technical quality; instructions; and printed documentation. They point out that the reviewer must decide which criteria are most important for particular types of programs, groups of students, and classroom situations.

Three evaluation forms are given, with examples of how they can be used. These forms were developed by the Northwest Regional Laboratory in Portland, Oregon; the National Council of Teachers of Mathematics; and the California Library Media Consortium for Classroom Evaluation of Microcomputer Courseware.

Section 4 covers the details of organizing and running a courseware library.

Section 5 contains a directory of recommended courseware. The authors give a brief description of each program, with the information necessary to obtain it. They do not provide their own reviews, but give references to reviews that have appeared in magazines and other publications. Only programs that have received positive reviews are listed.

Section 6 consists of appendices containing copyright regulations; sources of evaluation guidelines, courseware reviews and courseware directories; and policies and procedures for selecting instructional materials.

The *Courseware Report Card* and *Courseware in the Classroom* are mutually complementary. The former provides detailed reviews, and the latter provides information about doing your own reviews and finding other published reviews. Both publications will help educators find the software they need to make good use of computers with their students.

Dictionaries Of Computer Terms

A great many dictionaries of computer terms are available. Some are intended for children, some for adults who are novice computer users, and some for computer science professionals.

My pet peeve about computer dictionaries is what I call "recursive definitions." These define technical terms by using other technical terms. You look up a word, and the definition contains several words that you don't know. You look up each of these in turn, but their definitions contain more words you don't know. For example, one dictionary defines *instruction* as follows:

> Data which causes a computer to carry out an operation and specifies the values or *locations* of all *operands*. A *program controller* examines each instruction and initiates the specified action. An instruction usually contains an *operator* (indicating the type of command) and one or more *address* parts, and sometimes a *tag*.

The italicized words are defined elsewhere in the dictionary. How many people who looked up the meaning of "instruction" in a computer dictionary would know the computer jargon meanings of "locations," "operands," "address," and the other terms? If you are dedicated, you might look up each of these words and then look up the technical terms used in defining them. You might keep pursuing this through several levels of definitions and then try to finally figure out the meaning of the original word in which you were interested. However, I'd prefer a trip to the bookstore in search of a new dictionary.

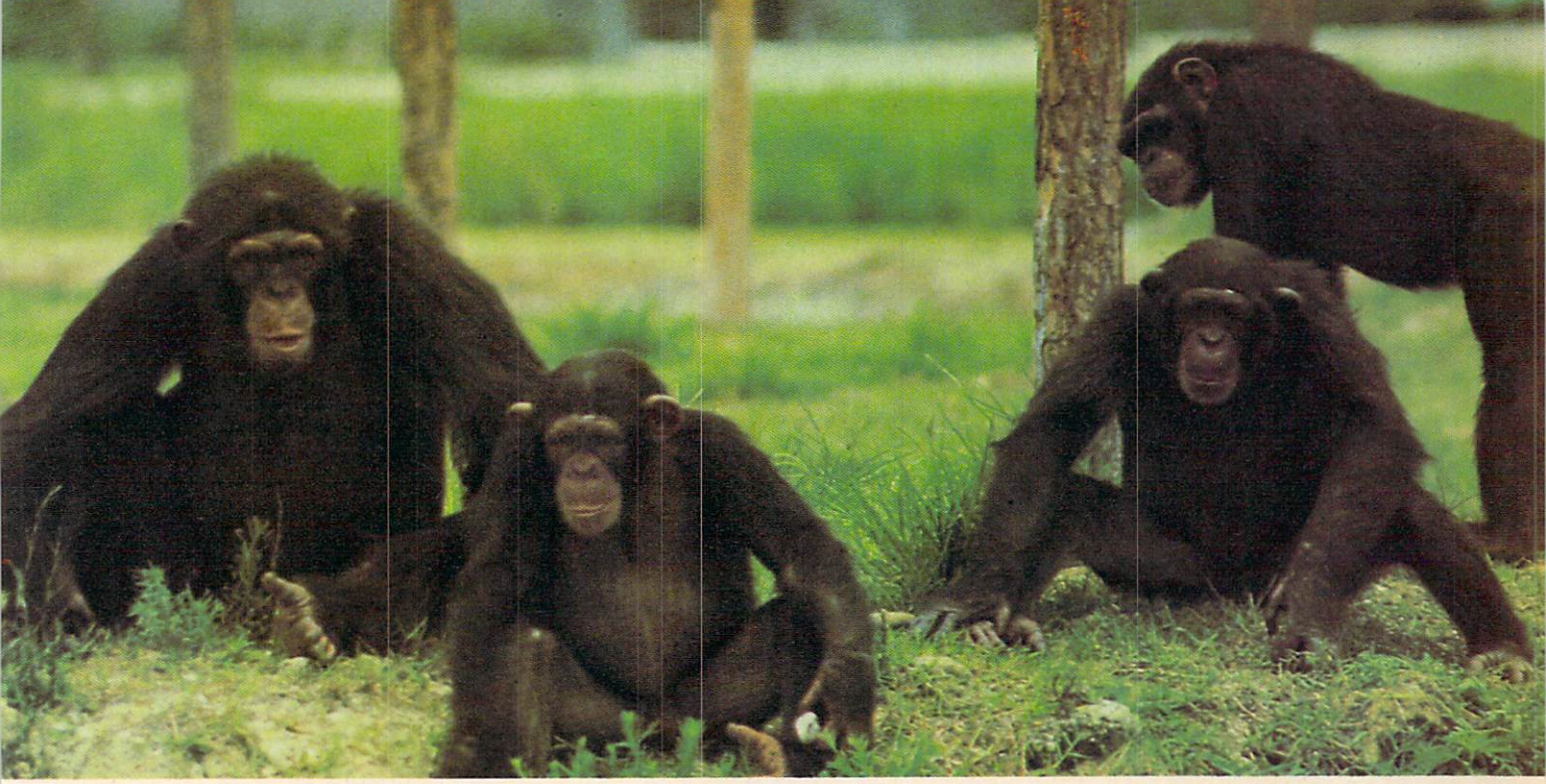
By the way, for those of you who are not familiar with the concept of *recursion*, a recursive procedure is one that can "call itself." Think of yourself as using a *find-the-meaning-of-a-word* procedure. One part of this procedure would tell you that if a definition contains a word you do not know, you put the original word on hold and apply your find-the-meaning procedure to the new word. That is, the procedure reapplies itself to a new word – an example of recursion. When you find the meaning of the new word, you return to trying to understand the meaning of the original one.

I have recently obtained two dictionaries that have mostly accurate and understandable definitions. Both are careful to provide clear examples and minimize the use of technical terms in definitions. For example, here are the definitions of "instruction" from the two dictionaries:

> A single operation to be executed by the computer. Instructions may move data, perform arithmetic and logic functions, control I/O devices, etc. A sequence of instructions forms a program.

> A single order that tells the computer to carry out some specific task. An instruction in a program might tell the computer to operate a line printer, add two numbers together, store information in memory, or to perform any one of a number of other functions. Each instruction must be retrieved from memory, decoded and executed by the computer's central processing unit. A *program* is simply a series of instructions designed to solve a problem or accomplish a task.

The first definition is from the *Illustrated Computer Dictionary*, by the editors of *Consumer Guide* (Exeter Books, 1983). This dictionary is intended for computer novices. The second definition is from *A Dictionary of Computer Words*, by Robert W. Bly (Dell Publishing Company, 1983). This one is designed for students and contains many good analogies and humorous illustrations. ©



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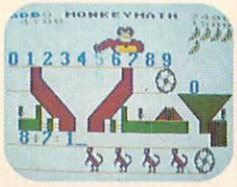

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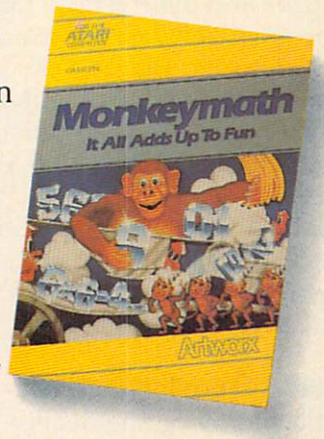

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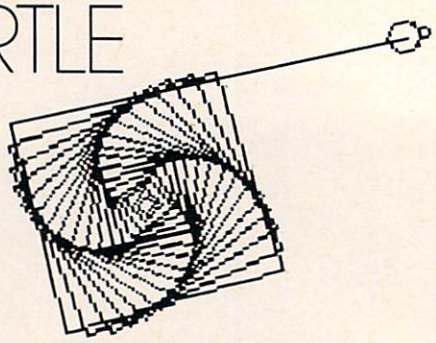


David D Thornburg, Associate Editor

Bucky And The Turtle:
Exploring The Geometry Of Thinking

The philosopher, mathematician, inventor, and citizen of the whole earth – R. Buckminster Fuller – died this past July at the age of 86. Bucky influenced many people through his mathematical discoveries, and delighted millions more through his designs resulting from these discoveries. The geodesic dome stands as the most easily recognized of his creations.

While we can appreciate the results of his thought, it is especially valuable for readers of this column to acquaint themselves with his "geometry of thinking" – a philosophy called "Synergetics."

Synergetics is a mathematical formalism that, according to Fuller, embodies the design principles of the physical universe. His exposition of these principles formed the subject of two books, *Synergetics* and *Synergetics 2* (Macmillan, 1975 and 1979, respectively). While many people marvel at the beautiful simplicity of the geodesic dome or of the tensegrity structures Fuller discovered, few have taken the time to understand the underlying mathematical principles that led to the creation of these structures.

It so happens that the principles of Fuller's geometry are easily grasped once one realizes that Synergetics is identical to the mathematical formalism of turtle geometry.

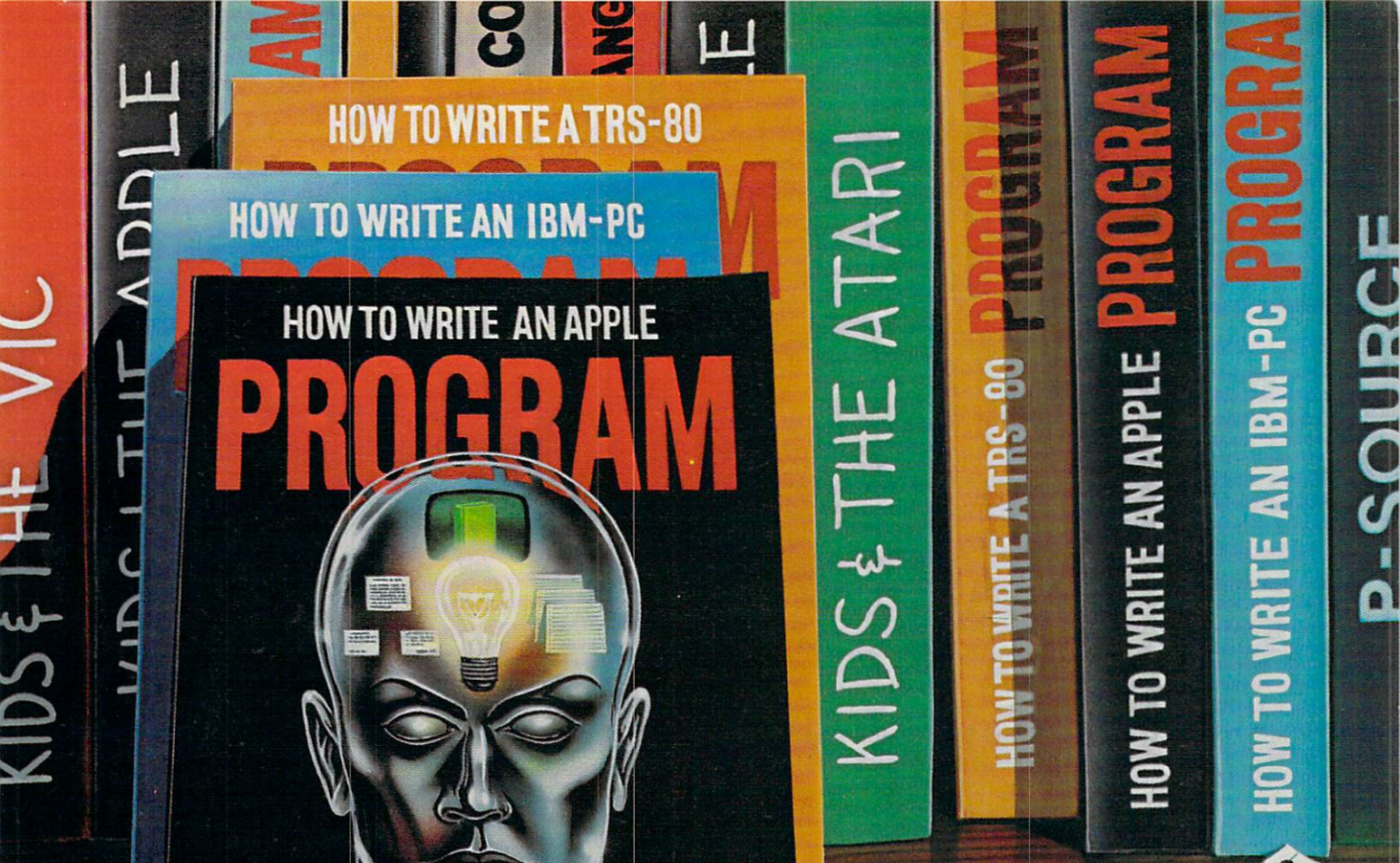
Process Descriptions

In turtle geometry one deals with process descriptions rather than with static descriptions of geometric figures. The two operators (FORWARD and RIGHT) change the state of the turtle and can be used to move it anywhere on a surface. As a result, any static figure can be equivalently described by the process that created it. Process-based descriptions are central to Synergetics as well.

While it is impossible to do justice to the formalism of Synergetics in the short space of this article, several key concepts (and their equivalent expressions in turtle geometry) will be described. Each concept will be presented first from the perspective of Synergetics and then from the perspective of turtle geometry.

1. *There is no continuum.* There are no solid surfaces in the universe, no flat or smooth areas. Wherever scientists have looked, they have only uncovered localized energy fields which we perceive as discrete countable atoms. These atoms establish spatial relationships with other atoms through mutual optimization of their energy fields. The idea that the universe is composed of countable parts, that it is somehow granular, has an interesting expression in turtle geometry. Since the turtle responds to one command at a time, either it can move or it can turn. The fact that the turtle cannot turn while moving means that, in common with Synergetics, turtle geometry does not allow continuous curved surfaces.

2. *Measurements in geometry need only two parameters – frequency and angle.* These two parameters are sufficient to describe the location and placement of the nodes associated with the discrete quantized atoms which comprise the matter of our physical universe. The process by which one can move between any two nodes in the universe is capable of being expressed in terms of a combination of linear movements along nodes



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and angular reorientations.

In turtle geometry, this central concept is expressed by the fact that combinations of the commands FORWARD and RIGHT are capable of repositioning the turtle to any desired location. Fuller's use of frequency instead of distance is a result of his desire to remove absolute scale from his geometry.

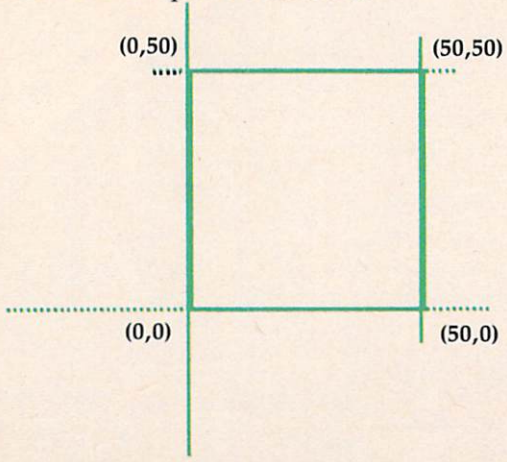
3. *There is no simultaneity.* The physical universe is an unfolding scenario of nonsimultaneous (but partially overlapping) energy events. The finite speed of light governs our perception of the physical universe. A pair of events that appear to be simultaneous to one observer will appear to be nonsimultaneous to a second observer at another location. Since nothing happens "all at once," then all events and structures are the result of a *process* which created them. Traces of completed events resulting from separate and distinct processes may appear similar to each other.

Simple Is Powerful

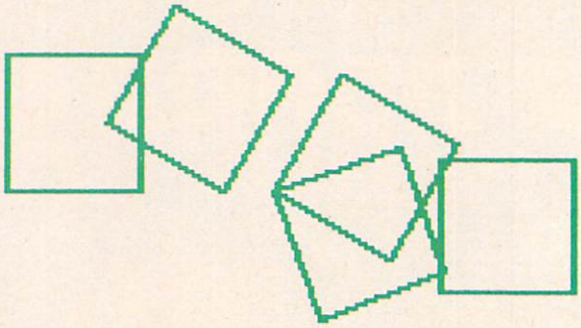
A problem with static descriptions of systems is that they do not preserve the details of the processes which created them. Since the process contains more information than the static trace of its result, a process description is inherently more fundamental. Furthermore, process descriptions are often more compact than static descriptions. This surprising result lends force to the idea that simpler descriptions are more powerful.

Turtle geometry *defines* objects through the description of the processes that create them. Computer-based implementations of turtle geometry allow the explicit creation of *procedures* that describe the steps needed to create various geometrical shapes. These procedures can often be treated as extensions of the computer language itself. Logo is a prime example of a language that does this.

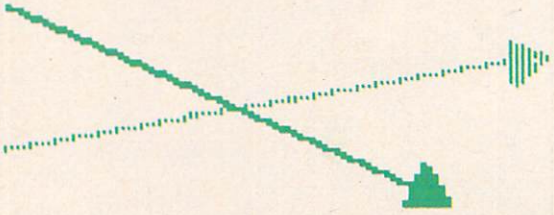
There are many advantages of process-based descriptions. In conventional coordinate geometry, for example, the static description of a square located on a grid consists of specifying the coordinates of the square's corners.



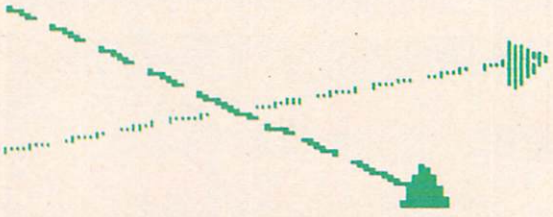
To create a new square at another location, one must create a new set of coordinates for each corner. In turtle geometry, once one has defined a procedure which creates a square, additional squares can be created by moving the turtle to a new location and using the "square" procedure at that point.



4. *No two events can occupy the same space at the same time.* Two energy events that are in close temporal and physical proximity will interact with each other in one of several ways, including:



a. *tangential avoidance.* One event can cross over or under another event.



b. *modulated noninterference.* If the energy events consist of a train of pulses and spaces, their paths can cross in a fashion similar to that displayed by two rows of cars which are changing lanes on a freeway.

c. *reflection.* Two events can reflect from each other and acquire new paths.

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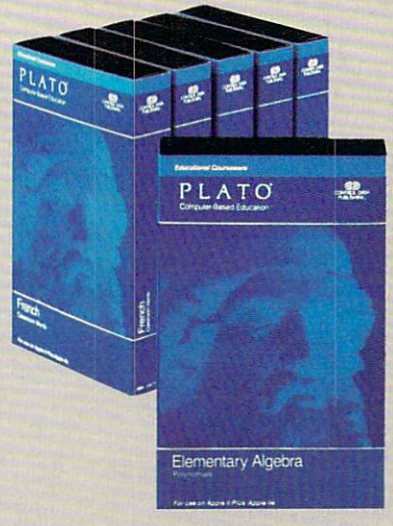

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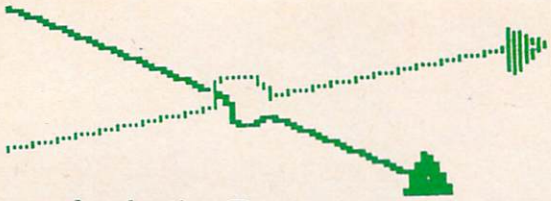
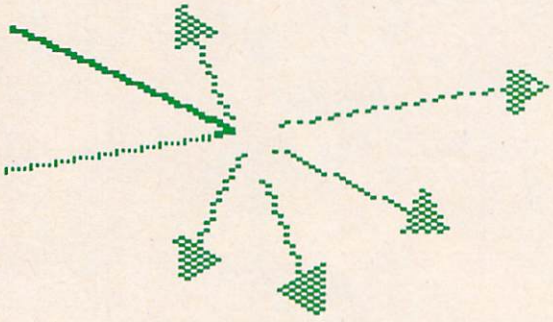
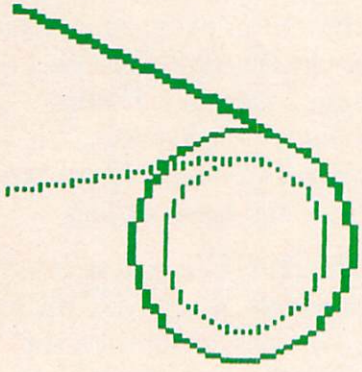


d. *refraction*. Two events can, on achieving close proximity, perturb each other's path to avoid a collision.



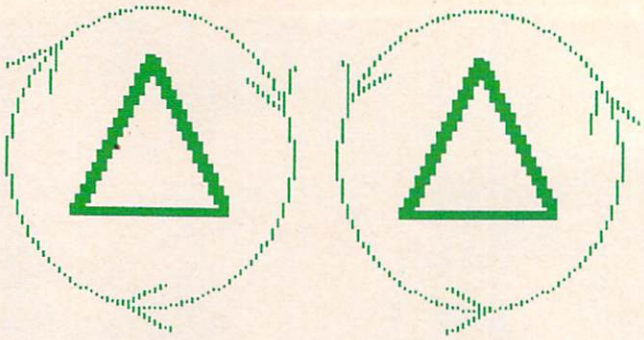
e. *collision*. When two energy events come into sufficiently close proximity, they may collide and smash into several other energy events which go off in a multitude of new paths.



f. *attainment of critical proximity*. When two energy events become sufficiently close, they may go into orbit around each other. As a result of this coupling, they form a new system.

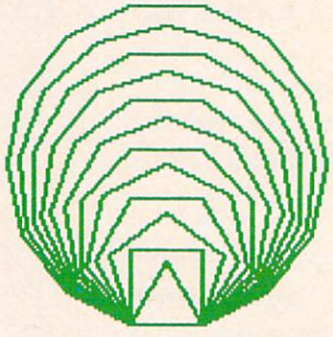
There are six ways in which two energy events can interact. There is *no* way two energy events can occupy the same place at the same time. The concept of a dimensionless point resulting from the intersection of two lines is thus meaningless in the physical universe.

In turtle geometry a secondary consequence of this concept is that different procedures can be used to create figures which appear to be identical. A triangle, for example, can be created by following a left- or right-handed path.



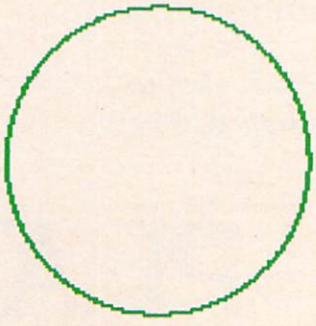
Even though the finished figures are identical (such paths are called *state change invariant*), the fact that they result from different procedures can have important consequences. For example, an assembly-line robot that moves parts between three work stations will only perform its job properly for one path description.

5. *Irrational numbers are unnecessary*. Synergetics involves a system of measurement based on discrete angles and countable frequency increments. Space-filling structures are formed from polyhedra, the minimum configuration of which is the tetrahedron. As the frequency of a structure is increased (by constructing polyhedra with greater numbers of nodes), one approaches the construction of objects that appear nearly round.



These objects are composed of a vast (but countable) number of discrete chords. Since such surfaces can be formed with any complexity desired, and since each surface is still bounded by chords, there is no need in Synergetics for irrational numbers such as pi.

This is easily demonstrated in turtle geometry. To send the turtle on a circular trip, one might instruct it to take 360 steps, turning by one degree after each step.



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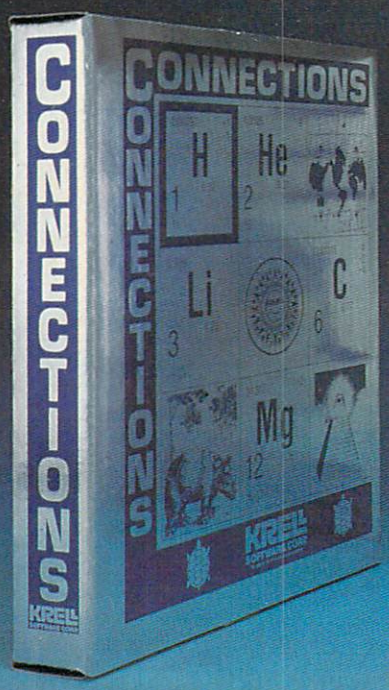

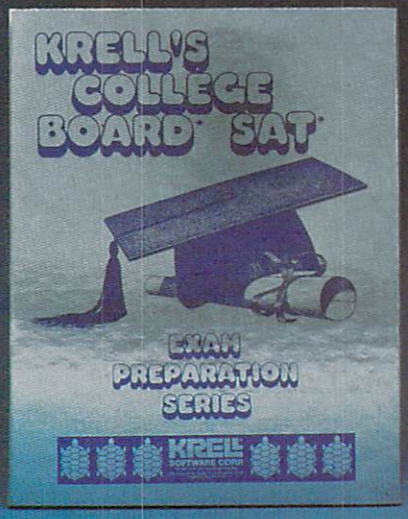

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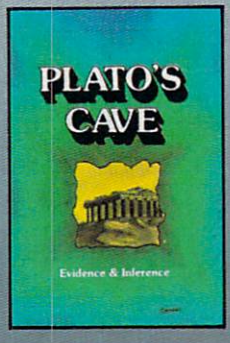

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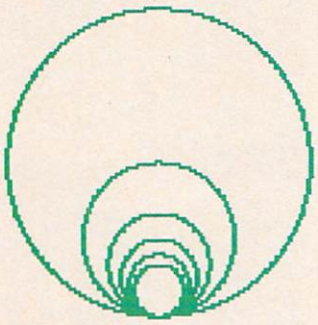
Circular paths with different sizes can be created by changing the size of the step or by changing the amount turned at the end of each step. Instead of dealing with the concepts of diameter and area, turtle geometry creates circles through the concepts of perimeter and curvature.



6. *Meaningful descriptions of processes are local.* Every celestial object is in motion with respect to every other object. These motions, viewed as a set, are nonsimultaneous.

Furthermore, the interactions of these various motions vary widely over the eons of time. As a result, any meaningful system of geometry must describe local processes without reference to an absolute origin. A description of a triangle must describe only the triangle itself and not be dependent on the reference frame in which the triangle is being envisioned.

The concept of local descriptions of geometrical figures is central to turtle geometry. In contrast to conventional coordinate geometry, turtle procedures provide *intrinsic* descriptions of objects. As mentioned before, a coordinate representation of a square applies to that one square only. The points on this one square are fixed in relationship to the origin of the coordinate system. In turtle geometry, on the other hand, a square is defined by the local steps that are needed to create it. A procedure such as:

```
TO SQUARE
   REPEAT 4 [FORWARD 25 RIGHT 90]
END
```

will always create a square path regardless of the turtle's location and orientation.

If, as Fuller believed, Synergetics provides the proper geometric framework with which to view the universe, then the incorporation of turtle geometry in various popular and user-friendly computer languages promises to help expand the awareness and creativity of all its users. The fact that many of the users of turtle geometry are children suggests that the child's view of the physical universe might have more power than we ever expected. ©

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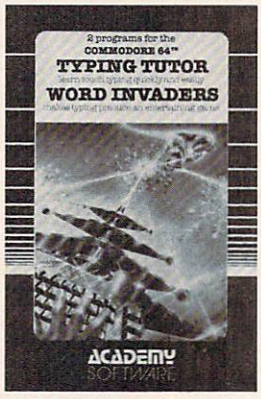

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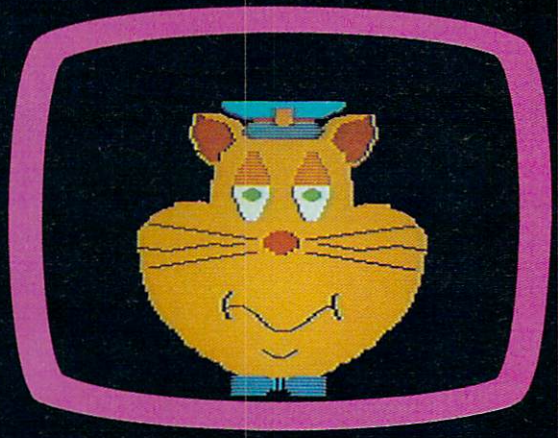

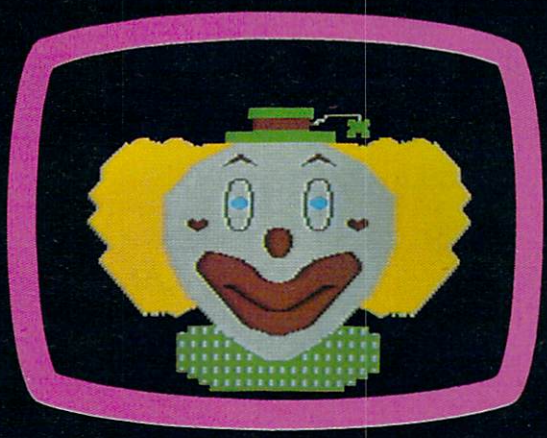

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Atari Key Panic

John Fackrell

This rapid-fire game tests your speed and hand-eye coordination. You must defend your home base against the increasingly fast character "bombs." Three skill levels, as well as final score and rank, are included.

"Key Panic" is a multilevel, fast-action game in which you must shoot descending characters that threaten your protective shields at the bottom of the screen.

Written on an Atari 800, the program has been condensed so it can run on an 8K Atari. It was originally designed to improve typing speed and key recognition (which it does), but it also turned out to be enjoyable as a game, too, with lots of player options.

Choose Your Bombs

After typing in the program, be sure to SAVE it. When you run Key Panic, you will be given several options.

First, use the SELECT key to choose one of three skill levels. You will probably have to play the game a few times to find the best level for you. Next, use the OPTION key to choose letters, numbers, or letters and numbers. This will determine what kind of "bombs" you'll have to contend with.

Now you're ready to play. Press START and the panic begins. As each character scrolls down, you must identify it and quickly press the corresponding key.

At the bottom of the screen, you'll have three protective shields. If you miss the right key or hesitate, the character bomb will strike and destroy your shield with a loud explosion. If you lose all three shields, the game ends and you will receive a score and rank.

If you're able to fend off all the characters in the first wave (approximately 50), there will be a short pause before the speedier second wave begins. There is a total of five waves, each progressively faster. Make it through all five waves and you win. You'll then receive a score and rank. Press START for another game.

Atari Key Panic

```
10 GOTO 510
20 ON OPT GOTO 30,40,50
30 CHR(Z0)=65+INT(RND(Z0)*26):RETURN
40 CHR(Z0)=48+INT(RND(Z0)*10):RETURN
50 CHR=INT(RND(Z0)+0.5):IF CHR=Z1 TH
   EN GOTO 30
60 GOTO 40
70 POSITION X,Y:? #Z6;CHAR$:RETURN
80 POSITION X,Y:? #Z6;CHR:RETURN
90 GOSUB 20:FOR Y=Z6 TO Z1 STEP -Z1:
   CHR(Y)=CHR(Y-Z1):POSITION Z9,Y:?
   #Z6;CHR$(CHR(Y)):NEXT Y
100 POKE 540,103-(SEL*25)-(WAVE*Z5):
    SOUND Z0,255-(COUNT*30),Z2,Z4+CO
    UNT
110 IF PEEK(540)=Z0 THEN 230
120 IF PEEK(764)=255 THEN 110
130 GET #Z1,KCHR:IF KCHR<>CHR(COUNT)
     THEN 110
140 POSITION Z9,COUNT:? #Z6;" ":CHR(
    COUNT)=32:SCR=SCR+(CINW*SEL):POS
    ITION Z1,Z3:? #Z6;SCR:CINW=CINW+
    Z1
150 IF CINW<>50 THEN 190
160 SOUND Z0,Z0,Z0,Z0:X=Z9:FOR Y=Z1
    TO Z6:CHAR$=" ":GOSUB 70:NEXT Y
170 WAVE=WAVE+Z1:IF WAVE=Z6 THEN 320
180 GOTO 760
190 IF PEEK(540)<>Z0 THEN 210
200 GOTO 90
210 IF COUNT<>Z1 THEN COUNT=COUNT-Z1
    :GOTO 110
220 GOTO 190
230 IF COUNT<>Z6 THEN COUNT=COUNT+Z1
    :GOTO 90
240 SOUND Z0,Z0,Z0,Z0:X=Z9:FOR Y=Z1
    TO Z6:CHAR$=" ":GOSUB 70:NEXT Y
250 COL=48:FOR X=Z1 TO 200 STEP 10:P
    OKE 712,COL:POKE 710,COL:FOR Y=Z
    1 TO Z2:SOUND Z0,X+Y,8,15:COL=IN
    T(RND(Z0)+0.5)
```

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VIC Typo Invaders

Kent S. Brewster

This game, similar in concept to "Atari Key Panic," was written for the unexpanded VIC. It not only plays fast, but also improves typing skills.

The Protection Of QWERT

Your mission in "Typo Invaders" is to protect the city of QWERT from the fatal alphabet bombs. As each letter drops, press the appropriate key before the bombs explode in the city.

With each pass, the bombs drop from an increasingly lower altitude. At the start of the game, you must choose a difficulty level (0 to 9). Points are awarded according to this level as well as the distance from the city when a bomb is destroyed. The game ends when QWERT is destroyed.

The program uses approximately 2700 bytes, which, of course, works fine with an unexpanded VIC. However, if your VIC has 8K or more expansion, change line 100 to:

```
100 SC=4095:CC=37887
```

Repeated exposure to Typo Invaders may have certain positive educational effects, such as a drastic increase in typing speed. My top score is 3641, but I expect that to be beaten handily by any competent touch-typist.

If you'd rather not type in this VIC program, send $3, a blank tape, and a SASE to:

Kent S. Brewster
1152 Snowberry Ct.
Sunnyvale, CA 94087

VIC Typo Invaders

```
1 REM **********************
2 REM *{3 SPACES}TYPO{2 SPACES}INVADERS
  {3 SPACES}*
7 REM **********************
8 :
9 REM *** STARTUP ***
10 PRINT"{CLR}":POKE36879,25:PRINT"NEED I
   NSTRUCTIONS(Y/N)"
20 GETA$:IFA$=""THEN20
30 IFA$="Y"THEN530
40 IFA$="N"THEN60
50 GOTO20
60 PRINT"{CLR}":PRINT"ENTER DIFFICULTY LE
   VEL{10 SPACES}0-9"
70 PRINT"(0=HARDEST, 9=EASIEST)
80 GETDI$:IFDI$=""THEN80
88 :
89 REM *** INITIALIZE VARIABLES ***
90 D=VAL(DI$):CP=495:DL=21:CS=486:CE=506:
   S1=36876:V=36878:WN=36877:S=0
98 :
99 REM *** MEMORY-DEPENDENT VARIABLES ***
100 SC=7679:CC=38399
108 :
109 REM *** SET UP SCREEN ***
110 POKEV,15:PRINT"{CLR}"
120 GOTO330
128 :
129 REM *** PICK A RANDOM LETTER ***
130 NL=CS-(DL*22)-1:OL=NL
140 R=INT(RND(0)*25+2)
150 OL=OL+1:NL=OL:IFNL=CE-(DL*22)THEN380
158 :
159 REM *** MAIN LOOP ***
160 POKESC+NL,R:POKECC+NL,6:POKES1,255-NL
    /22
170 FORI=1TOD*5+1:NEXT
180 POKESC+NL,32:POKECC+NL,1
190 NL=NL+22
200 IFNL>484THEN340
210 GOTO230
220 GOTO160
228 :
229 REM *** GET PLAYER'S KEY ***
230 GETA$:IFA$=""THEN220
240 IFCHR$(R+64)=A$THEN260
250 GOTO160
258 :
259 REM *** EXPLODE LETTER ***
260 POKESC+NL,R+128:POKECC+NL,1
270 POKES1,0:POKEWN,255
280 FORX=15TO0STEP-1:POKECC+NL,2
290 POKEWN,255-X:FORI=1TO25:NEXTI:POKECC+
    NL,1:FORI=1TO25:NEXTI:NEXTX
300 POKEWN,0:POKEV,15:POKESC+NL,32
308 :
310 S=S+10-D+(22-INT(NL/22))+22-DL:GOSUB4
    40
318 :
320 GOTO140
329 REM *** SET UP CITY ***
330 FORI=CSTOCE-1:POKESC+I,127:POKECC+I,6
    :NEXT:GOTO130
338 :
339 REM *** EXPLODE CITY BLOCK ***
340 POKES1,0:POKESC+NL,255:POKECC+NL,5:FO
    RX=10TO1STEP-1
350 POKEWN,180+X*5:POKESC+NL,127:POKECC+N
    L,4:FORI=1TO50:NEXT:POKESC+NL,255:POK
    ECC+NL,3
360 FORI=1TO50:NEXTI:NEXTX:POKESC+NL,32:P
    OKEWN,0
370 GOTO140
378 :
379 REM *** END THIS PASS, SET UP NEXT PA
    SS ***
380 NH=0:FORI=CSTOCE:P=PEEK(SC+I):IFP=32T
    HEN400
390 NH=NH+1:IFI=CETHEN410
400 NEXTI
410 IFNH=0THEN480
420 DL=DL-1:IFDL=3THENDL=4
430 N=INT(NH/2):CS=CP-N+1:CE=CS+NH:PRINT"
    {CLR}":GOSUB440:GOTO330
438 :
439 REM *** PRINT SCORE ***
440 PRINT"{BLK}{HOME}";
450 S$=STR$(S):LS=INT(LEN(S$)/2)
460 FORI=1TO10-LS:PRINT"{RIGHT}";:NEXT
```

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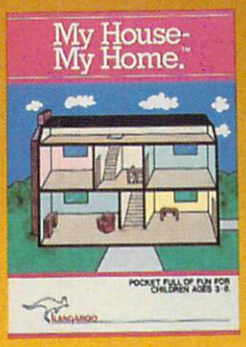

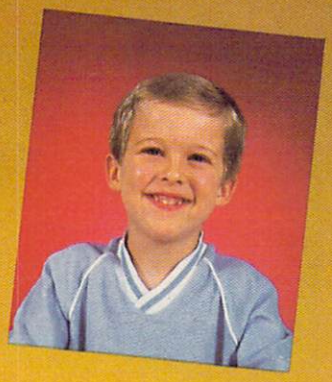

Jeepers Creatures and My House-My Home are each available for $34.95 at your software dealer or from Kangaroo, Inc., 332 South Michigan Ave. Suite 700, Chicago, IL 60604, (312) 987-9050. Visa, MasterCard and personal checks accepted.

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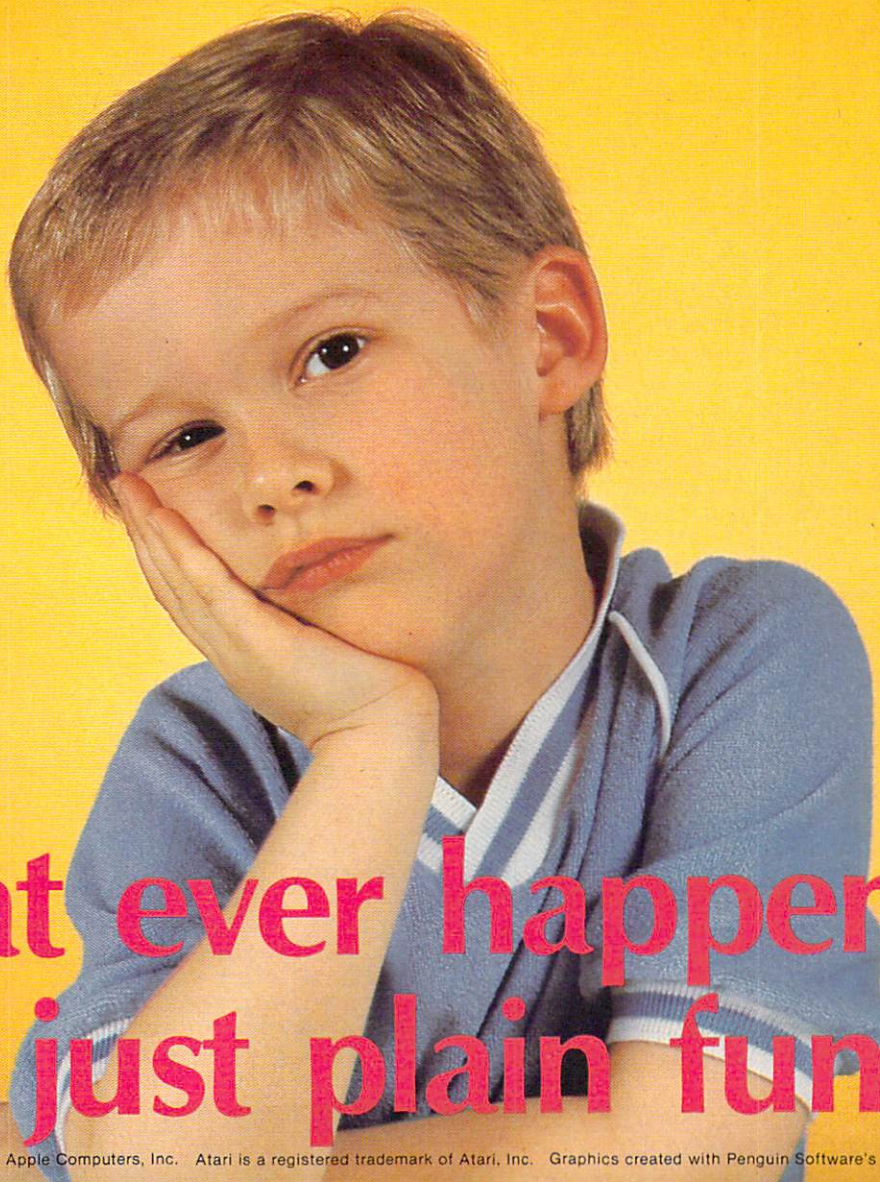

What ever happened to just plain fun?

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```
470 PRINTS$:RETURN
478 :
479 REM *** END GAME ***
480 PRINT"WANNA PLAY AGAIN?(Y/N)"
490 GETA$:IFA$=""THEN490
500 IFA$="Y"THEN10
510 IFA$="N"THENPRINT"BYE!":END
520 GOTO490
528 :
529 REM *** INSTRUCTIONS ***
530 POKE36865,130:PRINT"{BLK}{5 SPACES}TY
    PO INVADERS"
540 PRINT:PRINT"{RED}TYPOGRAPHICAL ERRORS
     ARE FALLING FROM ANOTHER GALAXY."
550 PRINT:PRINT" {BLU}DESTROY AS MANY AS
    {SPACE}POSSIBLE BY HITTING THE PROPER
     KEY."
560 PRINT:PRINT"{PUR}AS THE INVASION CONT
    INUES, LETTERS WILL DROP FROM LOWER L
    EVELS."
570 PRINT:PRINT"{RED}THE GAME ENDS WHEN T
    HE ENTIRE CITY IS WIPED{2 SPACES}OUT.
    "
580 PRINT:PRINT" {BLK}PRESS A KEY TO GO O
    N "
590 FORI=130TO25STEP-1:POKE36865,I:FORX=1
    TO5:NEXT:NEXT
600 GETA$:IFA$=""THEN600
610 GOTO60
```

```
260 IF COL=Z0 THEN 280
270 COL=48
280 NEXT Y:NEXT X:POKE 712,Z0:POKE 7
    10,Z0:SOUND Z0,Z0,Z0,Z0
290 Y=SHY:X=Z0:CHAR$="{20 SPACES}":GO
    SUB 70:SHY=SHY-Z1
300 IF SHY<>Z6 THEN 760
310 GOTO 350
320 X=Z2:Y=Z5:CHAR$="YOU":GOSUB 70:X
    =14:Y=Z5:CHAR$="WIN!":GOSUB 70
330 FOR X=Z1 TO 25:FOR Y=Z1 TO 20:NE
    XT Y:PT=50+INT(RND(Z0)*100):COL=
    Z6+16*INT(RND(Z0)*16)
340 SOUND Z0,PT,10,8:POKE 710,COL:PO
    KE 712,COL:NEXT X:SOUND Z0,Z0,Z0
    ,Z0:POKE 710,Z0:POKE 712,Z0
350 IF SCR<HSCR THEN 380
360 X=13:Y=Z1:CHAR$="HIGH":GOSUB 70:
    Y=Z2:CHAR$="SCORE:":GOSUB 70
370 Y=Z3:HSCR=SCR:CHR=HSCR:GOSUB 80
380 IF SCR<4000 THEN RANK$="EVE
    {3 SPACES}":GOTO 440
390 IF SCR<6125 THEN RANK$="OPWJDF":
    GOTO 440
400 IF SCR<12250 THEN RANK$="GBJS  "
    :GOTO 440
410 IF SCR<17000 THEN RANK$="HPPE  "
    :GOTO 440
420 IF SCR<18375 THEN RANK$="HSFBU "
    :GOTO 440
430 RANK$="FYQFSU"
440 ? "{5 SPACES}HBNF{6 SPACES}RANK:
    {6 SPACES}NEW GAME"
450 ? "{5 SPACES}PWFS{6 SPACES}";RAN
    K$;"{5 SPACES}PUSH TUBSU"
460 POKE 540,100
470 IF PEEK(540)<50 THEN X=Z1:Y=3:CH
    AR$="{5 SPACES}":SOUND Z0,Z0,Z0,
    Z0:GOSUB 70
480 IF PEEK(53279)=Z6 THEN X=Z2:Y=Z5
    :CHAR$="{3 SPACES}":GOSUB 70:X=1
    4:Y=Z5:CHAR$="{4 SPACES}":GOSUB
    70:GOTO 600
490 IF PEEK(540)=Z0 THEN CHR=SCR:GOS
    UB 80:SOUND Z0,105,12,Z4:GOTO 46
    0
500 GOTO 470
510 Z0=0:Z1=1:Z2=2:Z3=3:Z4=4:Z5=5:Z6
    =6:Z9=9:SEL=Z1:OPT=Z1:HSCR=Z0
520 DIM RANK$(10),CHR(8),CHAR$(20),S
    EL$(10),OPT$(18)
530 OPEN #Z1,Z4,Z0,"K:":POKE 82,Z0
532 GRAPHICS 18:X=Z6:Y=Z2:CHAR$="'PA
    NIC'":GOSUB 70:Y=Z4:CHAR$="REV.
    0.0":GOSUB 70:Y=Z6:CHAR$="06/28/
    82":GOSUB 70
534 FOR X=Z1 TO 750:NEXT X
540 GRAPHICS Z2:POKE 708,136:POKE 70
    9,202:POKE 710,Z0:POKE 711,54:PO
    KE 712,Z0
545 I=PEEK(16):IF I>127 THEN I=I-128
    :POKE 16,I:POKE 53774,I
550 Y=Z6:X=Z0:CHAR$="{7 TAB}
    {5 SPACES}{8 TAB}":GOSUB 70
560 X=Z0:Y=Z0:CHAR$="{20 TAB}":GOSUB
     70
570 X=7:FOR Y=Z1 TO Z6:CHAR$="{UP}
    {3 SPACES}{LEFT}":GOSUB 70:NEXT
    Y
580 X=Z1:Y=Z2:CHAR$="SCORE:":GOSUB 7
    0
600 SOUND Z0,Z0,Z0,Z0:FOR Y=7 TO Z9:
    X=Z0:CHAR$="{20 ■}":GOSUB 70:NEX
    T Y
610 X=Z1:Y=Z3:CHAR$="{5 SPACES}":GOS
    UB 70
620 WAVE=Z1:SHY=Z9:SCR=Z0:X=Z1:Y=Z3:
    CHR=SCR:GOSUB 80
630 X=53279:POKE X,8:POKE 752,Z1
640 SOUND Z0,40,Z4,Z4
650 IF SEL=Z4 THEN SEL=Z1
660 ON SEL GOSUB 2000,2010,2020
670 IF OPT=Z4 THEN OPT=Z1
680 ON OPT GOSUB 2030,2040,2050
690 ? "{CLEAR}TFMFDUJ ";SEL$;" PRUJP
    OH ";OPT$:? :? "{11 SPACES}PUSH T
    UBSU TO BEGIN"
700 FOR Y=Z1 TO 100:NEXT Y
710 IF PEEK(X)=Z6 THEN 750
720 IF PEEK(X)=Z5 THEN SEL=SEL+Z1:GO
    TO 650
730 IF PEEK(X)=Z3 THEN OPT=OPT+Z1:GO
    TO 670
740 GOTO 710
750 SOUND Z0,Z0,Z0,Z0
760 ? "{CLEAR}":? :? "{7 SPACES}ENTE
    RING WAVE NUMBER: ";WAVE:GOSUB 3
    000:? "{CLEAR}"
770 POKE 764,255:CINW=Z1:COUNT=Z1:X=
    Z9:FOR Y=Z0 TO Z6:CHR(Y)=32:NEXT
     Y
780 GOTO 90
1000 POSITION X,Y:? #6;CHR$(CHR):RET
     URN
1200 ON OPT GOTO 1210,1220,1230
2000 SEL$="BEGINNER ":RETURN
2010 SEL$="AVERAGE ":RETURN
2020 SEL$="EXPERT ":RETURN
2030 OPT$="LETTERS":RETURN
2040 OPT$="NUMBERS":RETURN
2050 OPT$="LETS.& NUMBS.":RETURN
3000 FOR X=1 TO 450:NEXT X:RETURN
```

COMM * DATA
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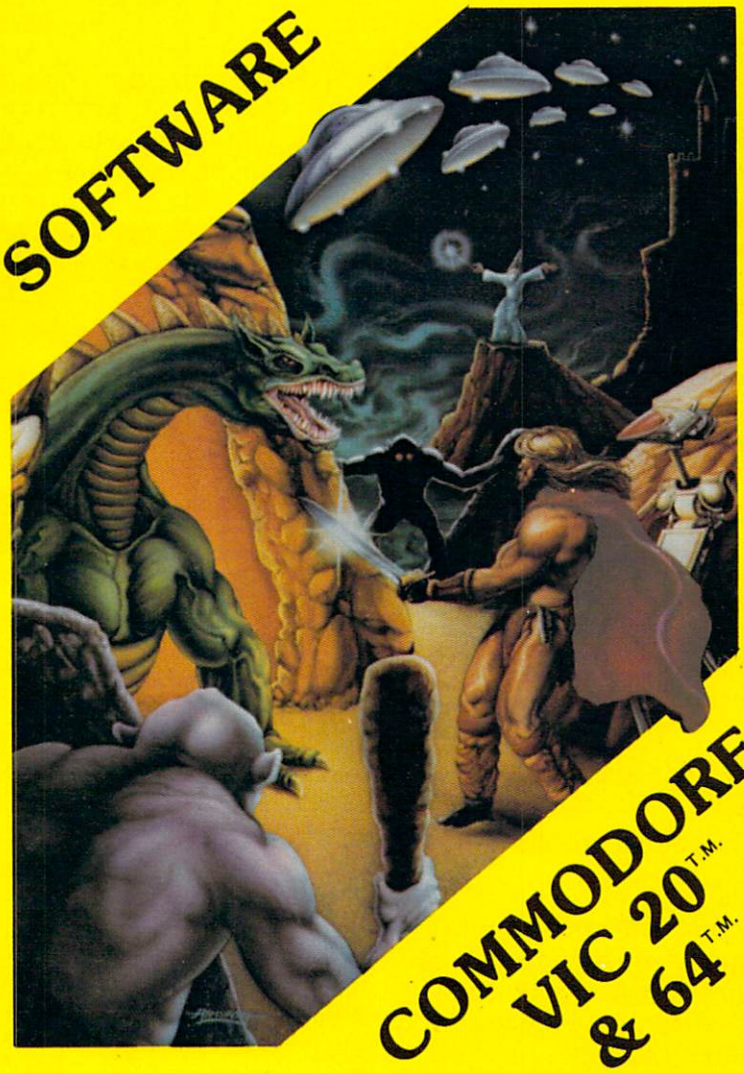
SOFTWARE



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Computers And Society

David D Thornburg, Associate Editor

This two-part series on program/languages began in last month's column with a discussion of VisiCalc *and* Rocky's Boots. *The concluding column examines the program* Dancing Bear *as a language and explores the potential impact of these types of languages.*

That's Not A Program, That's A Language

In last month's column, I explored the idea that some software offerings that we might consider application programs are, in reality, computer languages. In order for me to conclude that a program is a language, it must have the following characteristics:

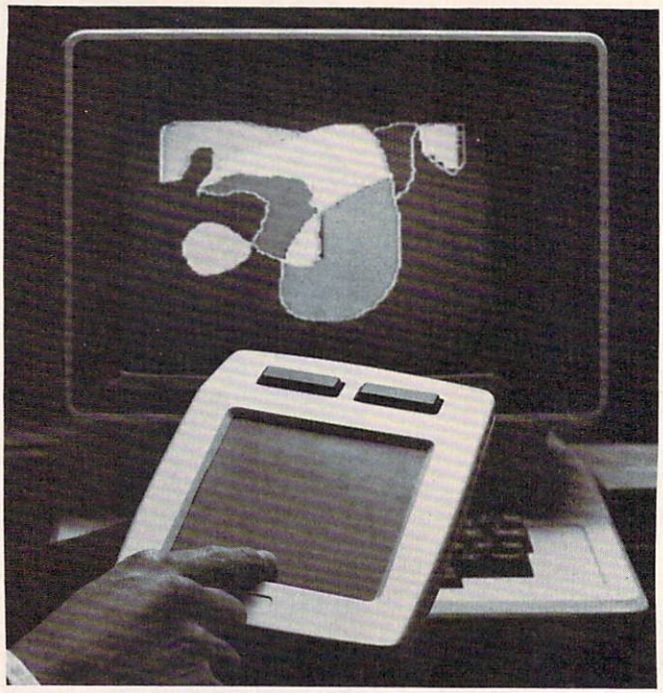
1. A computer language must allow the user to create computer-based activities that are custom-tailored to the user's needs.
2. The language must have a vocabulary and a grammar.
3. The user should be able to edit and save his or her program.
4. The user should be able to run the program.

I have read recently that some people think of word processing programs as languages. I disagree with this assessment of word processors since the word processor doesn't use the user's text to control the computer's activities. A word processor is simply a program designed to let users create text files that can be printed out. Admittedly, there are word processors that allow the creation of user-defined "macros" to perform complex formatting functions. But, while these macros are computer programs, this function is not a pivotal part of most word processing systems.

Dancing Bear As A Language

One program that is most definitely a language is *Dancing Bear* from Koala Technologies.

Koala is the manufacturer of the low-cost KoalaPad Touch Tablet which allows the simple use of a finger or stylus to convey position information to the computer.



One of the features of this device is its use of overlays that let the tablet be used both as a graphics or position input device and as a special-purpose keyboard.

Dancing Bear (currently available for the VIC) is a program which lets the user make an animated bear do a dance on the display screen. The stage on which the bear dances can be decorated with props by the user, and the bear can dance to user-defined music. This program (developed by Audio Light) uses the KoalaPad for all its input.

To see why this program is a language, we will briefly examine how it is used.

Creating A Dance Program

Dancing Bear uses the tablet overlay shown below.

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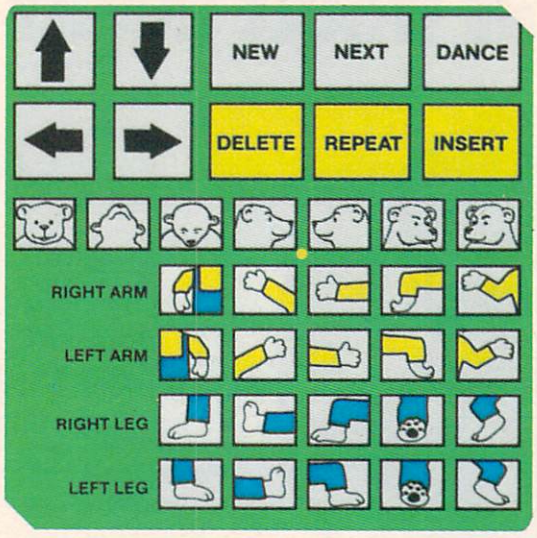
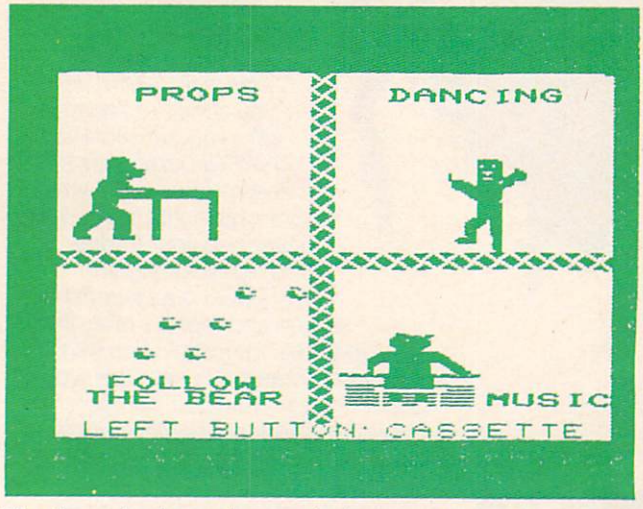
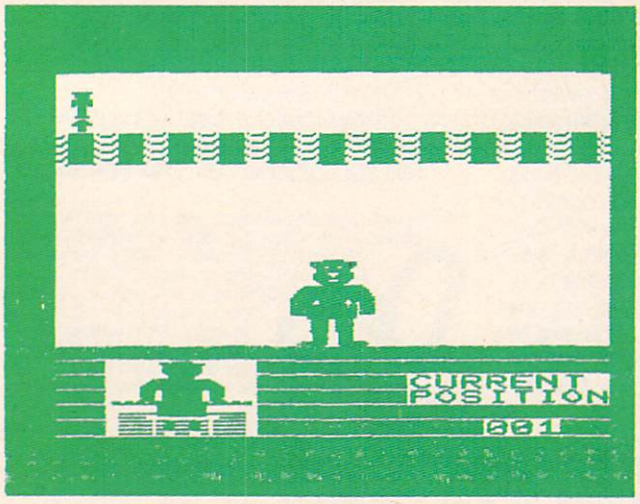


This overlay divides the tablet into three regions: bear position (upper left corner), body orientation (lower two-thirds), and program control (upper right).

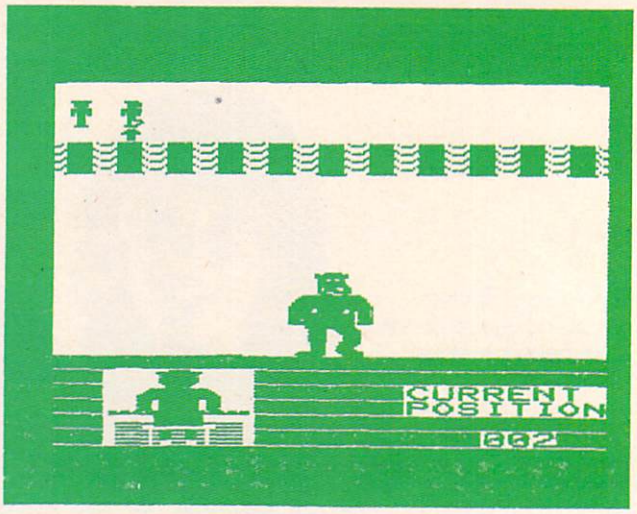
To create a new dance program, the user selects the DANCING option from the startup menu and presses NEW on the tablet overlay.



The bear is then shown in its starting position in the center of the stage.

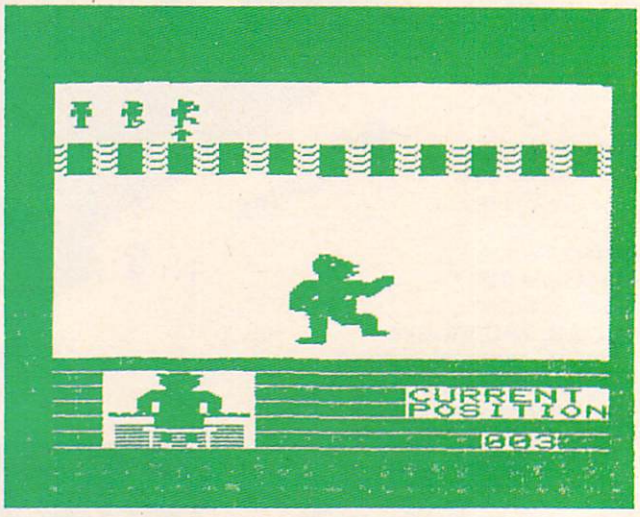


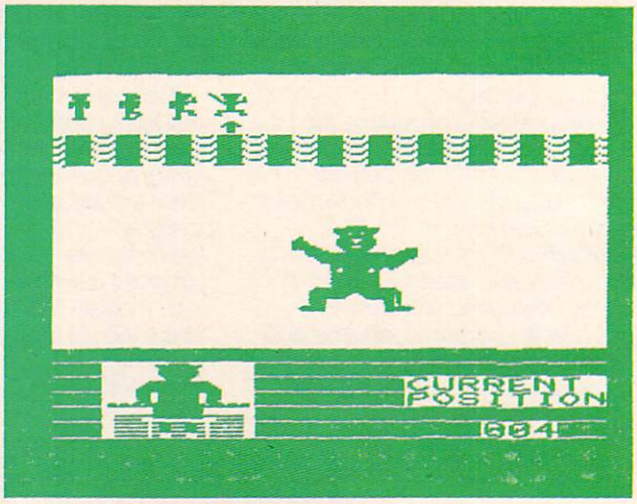
In the upper-left part of the screen you can see a small bear icon with an arrow underneath it. This is the program listing. To create the next step of the dance, we might press NEXT and turn the bear's head a little to the left and lift its left leg.



As you can see, these changes are reflected in the listing.

The next few figures show other steps in the sequence of this dance.





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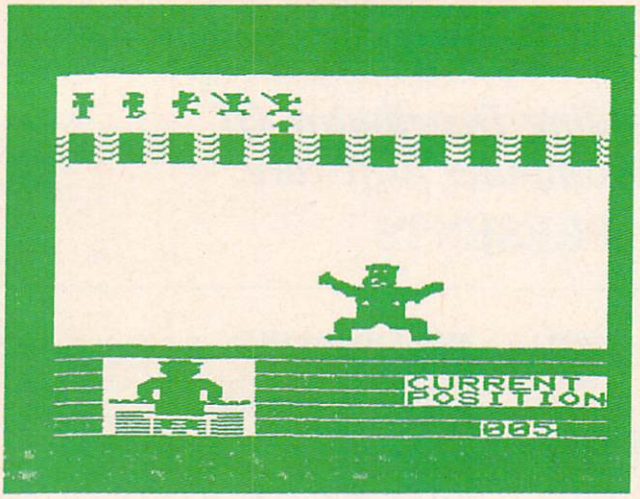
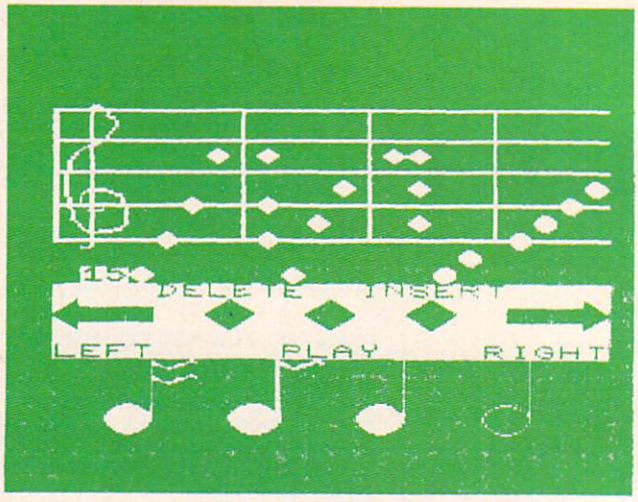


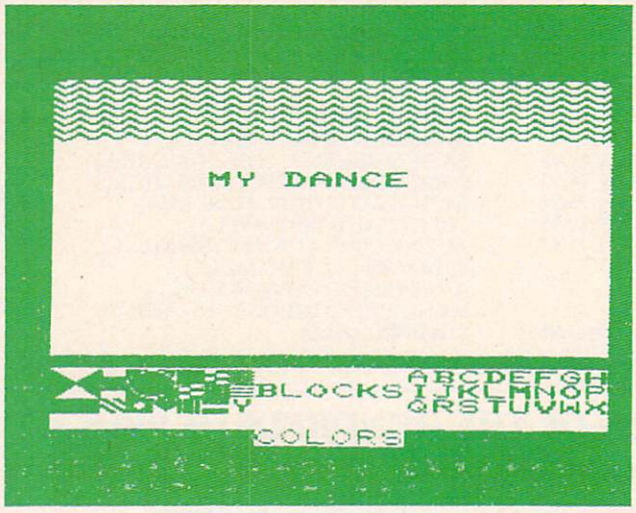


Language Adaptability

The top of the last figure shows the listing for this dance program. This listing can be edited, saved, or run. A REPEAT function allows any portion of the dance to be repeated as many times as desired.

The finished dance can be tested, edited, merged with user-defined (or predefined) music, and the stage can be outfitted with props.

The prop room lets you outfit the stage with blocks and labels. The set can be as elaborate or as simple as you desire.



The music editor uses the KoalaPad to pick up notes and place them on a stave. As with the dance itself, the music can be tested and edited if desired.

The entire dance program (props, music, and bear motions) can be saved on tape for later use.

If we accept that *Dancing Bear* is, in fact, a programming language (along with *VisiCalc* and *Rocky's Boots*), one might legitimately ask "Who cares?"

I guess the point is that languages are fundamentally more powerful than application programs because they let the user gain control over the computer system. Admittedly, *VisiCalc*, *Rocky's Boots*, and *Dancing Bear* don't offer the degree of access to the computer found in languages such as PILOT and Logo, but they offer far more control than fixed-function application programs.

The personal computer is unlike any other appliance to ever grace the home. Where the washer, stove, or television has fixed functionality, the computer is, by design, a general-purpose machine. Ultimately, effective use of this machine will only come when each user feels comfortable in molding the computer's applications to his or her own needs. This molding process requires programming skills on the user's part.

Since the beginning of the personal computer industry, we have been trained to believe that computer programs were linear strings of text. In this regard, the only differences between BASIC, Pascal, and Logo are grammatical.

VisiCalc, *Rocky's Boots*, *Dancing Bear*, and other languages of this sort point to another type of language – one that is more parallel than serial in its programming style. It is significant that these three programs (and others that have similar characteristics) are designed for nonprogrammers to use.

I see the continued development of languages of this type as a revolutionary force that will finally make programming a natural activity for *every* user of a personal computer. ©

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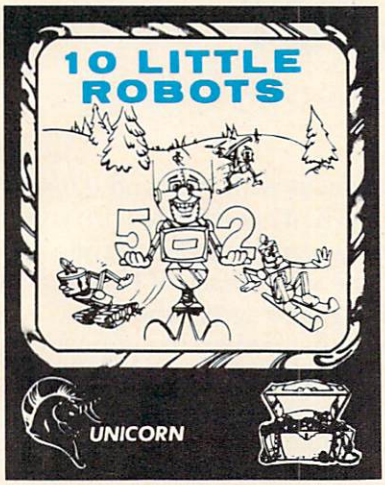

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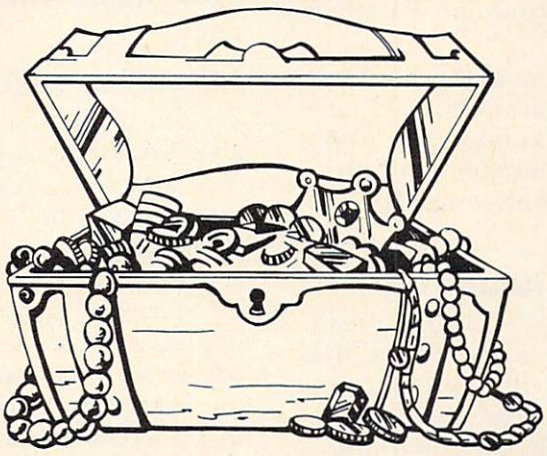

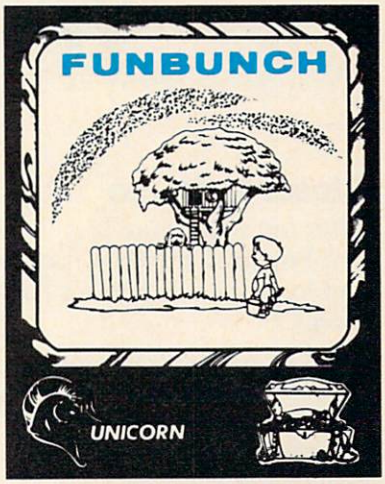

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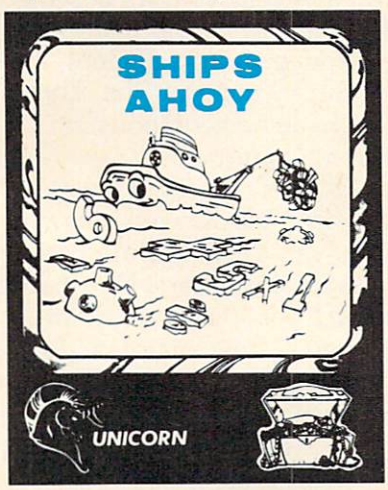

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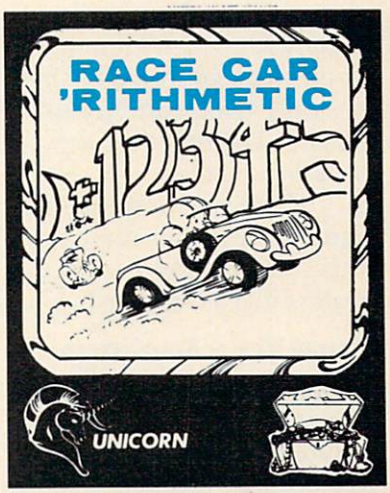

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On The Road With Fred D'Ignazio

How To Get Intimate With Your Computer

Part 2

Closer To Home

After my whirlwind travels across the United States and England, I'd like to take a break for a month and look at an important issue that is closer to home.

Elsewhere in this issue (in my "The World Inside The Computer" column) I begin a discussion about the difference between computer literacy and computer intimacy. I'd like to continue that discussion in this column.

Let's look at the myths that make adults so anxious and fearful about computers. We'll see how most adults who want to know more about computers should become intimate with computers before they try to become computer literate.

The Myth Of The Klutzy Adult

A pervasive and pernicious myth is being spread unthinkingly throughout our society. The myth is that our children are whizzes with computers, but we adults are klutzes. This myth is almost completely ungrounded in fact. Why are children so good with computers? They are good because they see only the colorful, musical, exciting side of computers. The first time they meet a computer, it is wearing a smile.

Children are spurred to master computers because they are so attractive. When we adults see this side of computers, we, too, can master computers just as fast, just as happily as our children.

Trust Your Feelings

What is computer intimacy? What is intimacy? Intimacy is a gut feeling. You know you have become intimate with your computer when you are totally comfortable and relaxed with it, when using it becomes a pleasure rather than a chore, and when you develop excuses just to spend more time with it. When you begin to think your computer is lovable, that's when you know the two of you are becoming intimate.

Getting to know a computer can be like getting to know an attractive yet intimidating member of the opposite sex. I think there is a great similarity between my first experiences with girls and dating, and the average person's first experience with computers. When the average person first looks at computers, he or she feels the same sense of fear and anxiety that I felt when I gazed across the gymnasium floor at the girls clustered on the opposite side of the room. That was my first school dance. Computers evoke the same sense of shyness, yet they can also be tremendously attractive, even seductive.

A New Love Affair

For almost 75 years, Americans have had a love affair with their cars. Computers will soon be like cars. Like cars, they will remain machines, and our servants, yet they will also have an emotional, gut-level appeal that will turn people on and bind them to them.

The kind of car we drive depends on the kind of person we are or would like to be. Our car's appearance, model, and year often accurately reflect our values and the kind of image we want to project to our fellow human beings. Cars project all sorts of images. They can be inconspicuous, efficient, and sedate, or they can be clunky ragamuffins. They can be flamboyant, garish, and ostentatious, or they can be sensual and adventurous.

Computers, too, will soon reflect our lifestyles, values, and self-image. They will also reflect our needs. Like cars, computers will come with model names pulled from the animal kingdom. Depending on our needs, we'll buy a Cobra (fast as lightning), or a Hippopotamus (it digests huge quantities of information), the St. Bernard (it saves your life in tight situations), the Peacock (it really struts its stuff), or the Donkey (slow and stubborn, but real dependable).

Computers, like cars, can evoke a passionate attachment, a rush of affection. But to inspire real intimacy they must throb to life at the turn of a key, and they must get us where we're going – the faster the better.

A computer can be seductive and lovable, but it is not an end in itself. Many people can get excited about a computer for its own sake. Many

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more, however, can get excited about using a computer to have fun, get work done, and communicate with other people.

In the future, computers will promise even more than they do today. But let's make sure they keep those promises.

More Than Tools

Computers are only machines, but they are more than tools. A hammer is a tool. So is a broom. But can you get intimate with a hammer or a broom? Not easily. Yet it's easy to get intimate with a computer, because computers are more than workhorses and tools. Computers obey our commands. They carry on conversations. They listen to us. They are infinitely patient. They can be friendly, playful, even silly.

Friendly computers? Playful computers? Silly computers? Where do you find them? Just ask a child. Children love computers because they use computers to learn and have fun. But why can't adults learn on computers, too? And why should kids have all the fun? Adults who peek over kids' shoulders at their programs find that the programs are challenging, enjoyable, and enlightening. Adults can use these programs, overcome their fears about computers, and relieve their computer anxiety. Adults can get to be just as good with computers as kids, and they can have just as much fun.

Computers That Frown And Look Mean

Most adults still think that computers are dry, cold, and unfriendly. No wonder! Most computers in the past were number crunchers, bill collectors, and tax watchdogs. Even today's computers, in their heart of hearts, do nothing more than juggle ones and zeros. But computers don't have to be technical and boring. They can be funny – if you just add people. The relationship between computers and people is often hilarious, if we keep a sense of humor. It pays to look at the lighter side of this relationship, and if we do, we find it helps to break down the barrier of fear separating us from the computer.

Coming Out Of The Closet

In recent years all sorts of groups have come out of the closet and have honestly revealed who they are and what they stand for. It's time that computer lovers do the same.

As a person who is on extremely intimate terms with his computer (it follows me into my bathroom and into my bed), I'd like to confess here and now one of the most closely guarded secrets of our relationship:

My relationship with computers is not rational.

This is a shocking revelation, but it is true. My relationship with my computers is emotional, quirky, and antic. It is infuriating, enlightening, and silly. It is happy, frustrating, and ecstatic. But it is rarely rational. And I contend that this is true throughout our society among the millions of computers and computer users. A rational relationship between a human being and a computer is the exception rather than the rule.

Take today. My assistant and I were working on a personal computer. We were sailing along, turning out letters, articles, and forms at a swift, productive pace. The world looked bright, and we were happy.

Then disaster struck. The computer made a mistake. The computer's mistake was only a little one. It wouldn't save any of our text files on disk so that we could print them out on the computer printer.

Until it made its mistake, the computer had been behaving itself. I felt very close to the computer and was extremely fond of it.

After the computer made its mistake, I had a change in heart. No matter what I did, the computer wouldn't save or print my files. So I hated the computer. I called it names. I threatened to walk out on it, abandon it, put it up for adoption.

Now I ask you, does this sound like a rational relationship?

A rational relationship must have at least two parties who are rational. First we look at the first partner – the human being. Occasionally, philosophers have proposed that humans are rational, but most of us know otherwise.

Next let's look at computers. This is more of a problem. Computers are incredibly complex machines, composed of millions of interacting circuits and thousands upon thousands of operating instructions, rules, and conditions. Computers are too complex to be simple, too complex to be totally rational.

Nevertheless, people think they are rational. For example, the popular wisdom now contains two catchy phrases that most people unquestioningly believe:

> First: Computers don't make mistakes. Only people make mistakes.
>
> Second: Computers do only what you tell them to.

As I mentioned, I am extremely intimate with computers. Since I am in this privileged position (along with two or three million children), you would think that I would be able to see through the popular wisdom and realize that the two catchy phrases above are pure hogwash – myths and nothing more.

Alas! I am as much a victim of these myths as the next human being, at least when I am working with my assistant. Whenever anything goes wrong while she is using the computer, whenever

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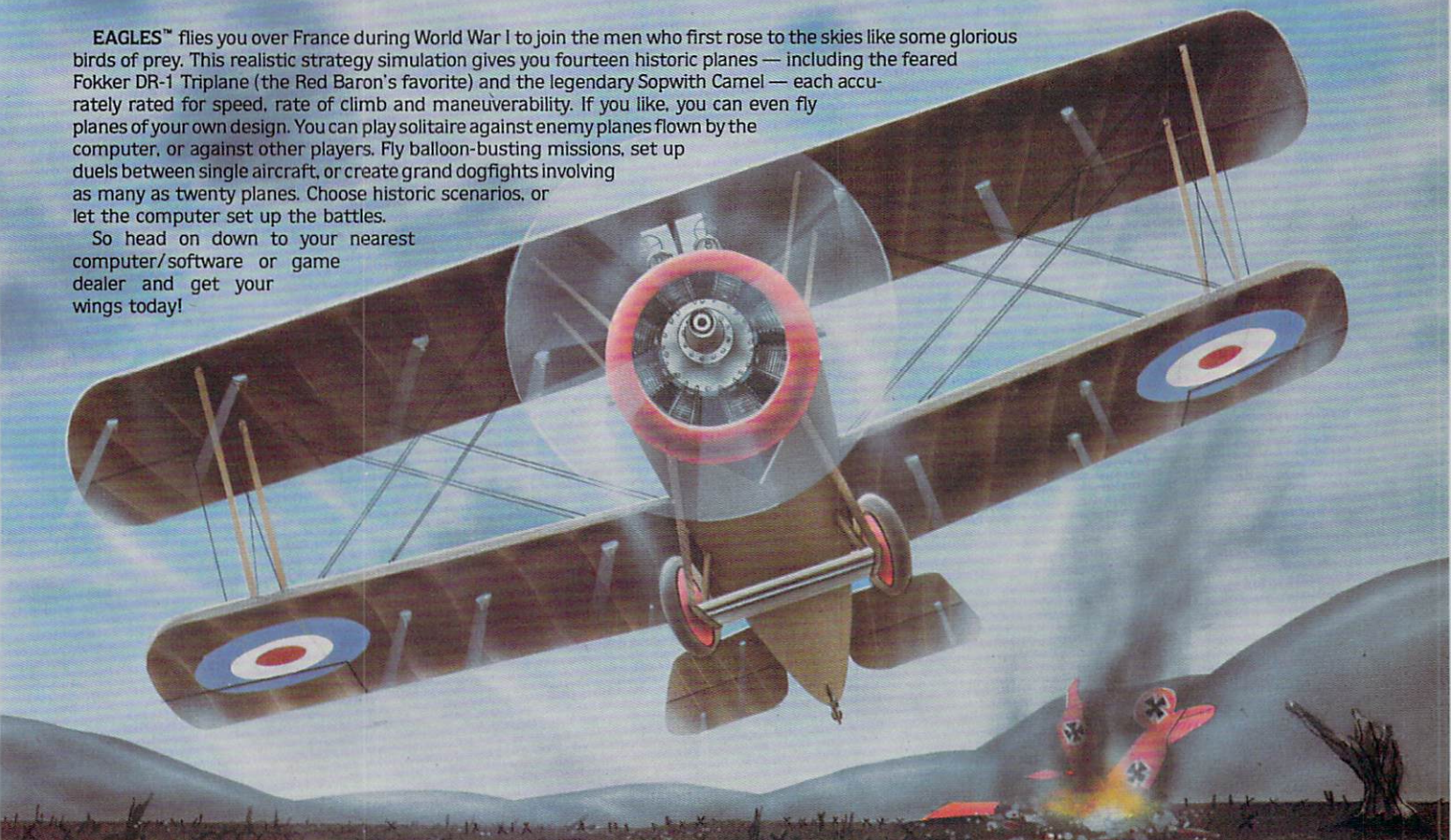

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the computer acts strange, whom do I blame? Why, her, of course.

Take the other day. I was upstairs in my study and Darshi, my assistant, was downstairs in the office. All of a sudden, she yelled, "Fred! Come quick! The computer's going crazy!"

Sure enough, the cursor was rolling across the screen wiping out the words almost like Ms. Pac-Man rushing around devouring dots. I pushed every button on the keyboard, but nothing worked. The cursor was determined to eat the whole file.

Finally, in desperation, I turned off the computer. Then I turned toward Darshi. "What did you do?" I said, in a not very friendly voice. "The computer was fine just a few minutes ago. You must have done something to mess it up."

Sadly, this was the last thing Darshi needed to hear. She was already extremely timid around the computer and afraid that the next button she typed might blow the computer up. When I accused her of her worst fear, she looked ill and ran out of the office.

Why had I blamed Darshi? I blamed her because she was a beginning user and a human being. Those two facts alone were enough evidence to convict her.

Sometimes computers are agreeable, responsive, and meek. They do everything you tell them to. But then, a moment later, without any warning, they turn on you. They suffer amnesia. They pout and get sullen and write gobbledygook all over your lovely files. Or they act crazy and start doing awful things like eating up the words on your picture screen. And they get out of control. Then the only way to get their attention is to switch off their power. This, of course, is an undesirable and drastic solution. But, sometimes, it's the only way to make them come to their senses.

A Little Breathing Room

When you are in the middle of a squabble with your computer, it doesn't seem very funny. However, after things have quieted down, and you look back, you might be able to put things into perspective, and maybe even laugh about them.

But one thing you should not do is pretend that you and your computer have a rational relationship. It is anything but that. It may be quiet, sedate, and low key. Or it might be wild and boisterous. But it is not rational. It can't be. You're not rational. The computer's not rational. So how can your relationship be rational?

The sooner people stop looking at their relationship with computers as rational, the sooner they will become intimate with computers and learn to accept them for what they are. Computers are moody and complex creatures. But they try hard to please you. They really do. ©

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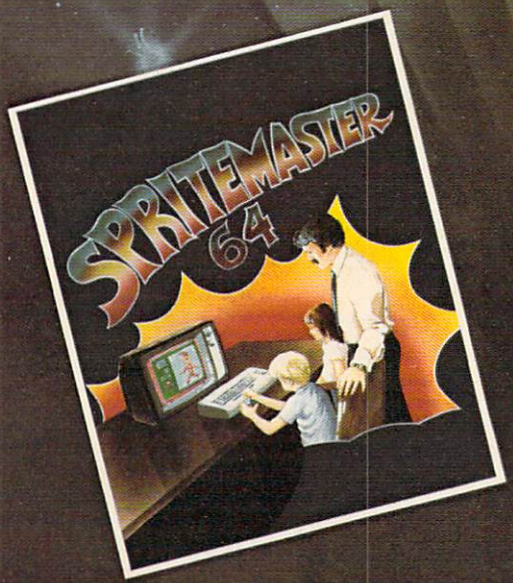

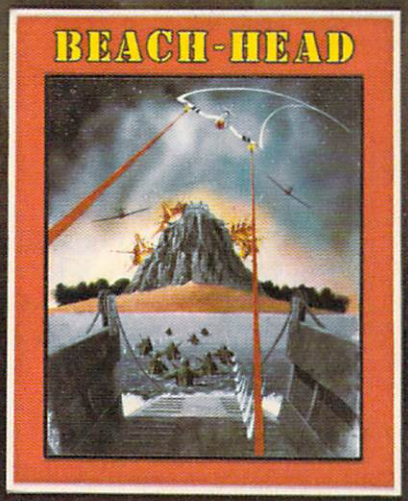

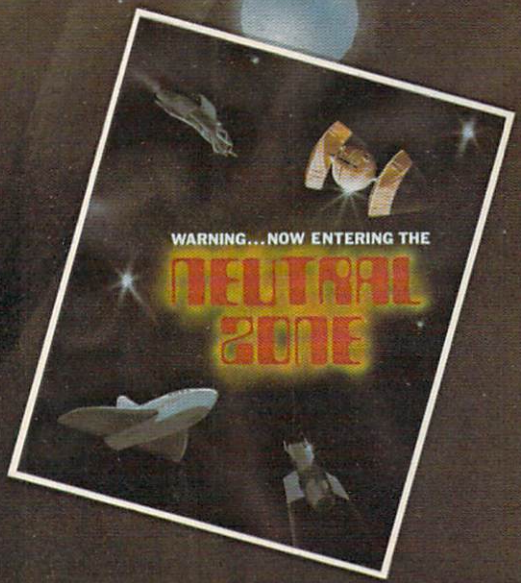

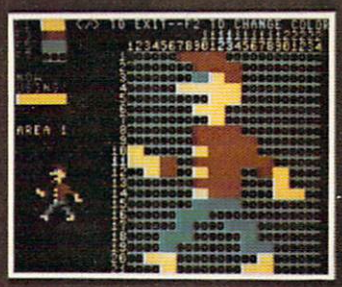

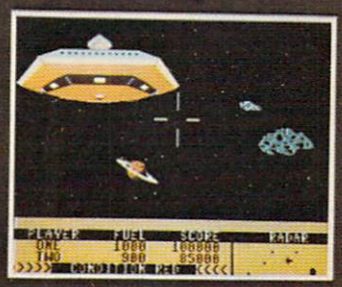

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Richard Mansfield, Senior Editor

Zones Of Unpredictability

What's the most random thing you can think of? Lightning? A tossed coin? Teen love? No matter what you come up with, one thing that will not be on the list is your computer.

Few things made by man are designed to be more logical and predictable than computers. And yet computers must sometimes work with the unexpected, the irrational. If one of the uses of a computer is to imitate reality, they'll have to be able to come up with odd, random events from time to time. This is where the BASIC word RND comes in. Its job is to surprise us. We should never be able to predict how it will react.

Say you want to write a guessing game program. You want it to provide addition problems for a child to solve. There are two ways to go about it. You could construct a huge list of problems and answers, and then have the computer remember them in a massive series of DATA lines in the program. This solution has two big drawbacks: it takes a lot of time to type in the problems, and the game will ask the same questions each time it's played.

A better way would be to have the computer randomly pick the numbers for each problem. Take a look at our sample program. Line 120 establishes that we are going to ask ten questions in this quiz. Line 120 works in partnership with line 200 and means that what's enclosed between those lines will operate ten times. The NEXT word causes a counter to raise itself once each time NEXT is encountered while the program runs. So, when NEXT causes the I variable to raise up to 11, the program "falls through" to line 210 which informs the player of the score. There's nothing beyond line 210, so the program ends.

RND is at the heart of this program in lines 130 and 140: variables X and Y each receive a different random number between zero and nine. If you type ? RND (1) * 10 several times, you'll see various numbers, but all will be lower than 10. (To get numbers between zero and ten, you'd use: RND(1)*11.) Typing ? RND (1) without any multiplier will give random fractions between zero and one. So, to get a useful integer for the purposes of our quiz, we have to multiply the fraction by ten and then round off the result by using INT( ).

The rest of the program is straightforward. Line 150 prints the problem, and line 160 accepts the answer from the player. Line 170 sends the computer to the "correct answer" response in line 190. If the answer is incorrect, we "fall through" to line 180 to announce the error. The score (T) is kept in line 190.

It would be easy to make this a more difficult quiz by changing the 10 in lines 130 and 140 to, say, 100 to allow larger numbers in the quiz problems. Also, it could be transformed into a test of division, multiplication, or subtraction by changing the + symbol (to / or * or −) in lines 150 and 170.

The Most Random Thing In The Room

But how "random" can something actually be, considering that it's coming out of the fiercely logical world of the computer? We won't go into heavy duty philosophy here, but there are some arguments that there isn't *any* way to generate truly random numbers. In any event, there's one aspect of RND which affects our quiz program and other games.

Inside the computer is a little engine designed to produce random numbers. It's called the random number generator and it's got to start with something. That something is called the *seed* and, in some computers, the same seed is put into the generator each time the computer is turned on. So, you will get the *same sequence* of random numbers each time you start a game after powering up your computer. We haven't solved the "same quiz each time" problem at all. Try it with our program here.

On the Atari, this isn't a problem because RND (0) results in nonrepetitive sequences. On the TI, you can use the word RANDOMIZE at the start of a program. That solves the problem. (Note too that TI BASIC uses the word RND without

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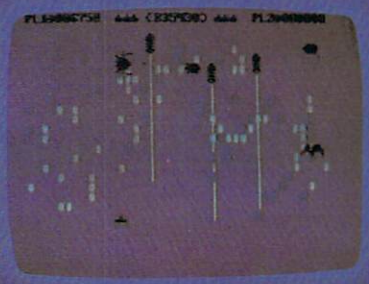
Widow's Revenge



This is another exceptional example of what the 64 can do. From the crawling of the web-slingers to the flapping wings of the egg-layers, author Doug Underwood has done an artist's quality job on animation. This program is similar in format to Exterminator . . . but, though of the same universe, worlds apart. **Widow's Revenge** is a one or two player game that you will find very hard to put away. **$24.95** (available in cartridge or disk)

To be exact, we'll pass **6.4 bucks** to you when you purchase both games. Mail us the warranty cards from both **Exterminator 64** and **Widow's Revenge** and we'll send you **6.4 dollars!** We also have two exciting new programs for the VIC 20™ . . .

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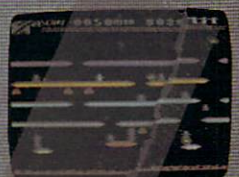
King's Ransom by Scott Elder



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anything in parentheses.) But on Commodore computers, you need to find a way to make the sequences of numbers different.

The solution is to introduce a random seed. On Commodore machines, you can use RND (-TI) instead of RND (1). RND (-TI) takes its seed from the computers' internal timers and results in sequences which will not repeat. How? The timers are very fast. If the seed is coming from the timers, then the exact seed will depend on when you, the human, type RUN. Since it's unlikely that you'll ever turn on the computer, LOAD the game, and type RUN in precisely the same amount of time, the timer value will be different for each game. Therefore, to randomly seed the random generator, we can rely on the most random thing in the room, you.

Math Quiz

```
100 PRINT" MATH QUIZ"
120 FORI=1TO10:PRINT:PRINT "PROBLEM NUMBE
    R" I
130 X = INT(RND(1)*10)
140 Y = INT(RND(1)*10)
150 PRINT" ";X:PRINT"+";Y
160 INPUT ANSWER
170 IF ANSWER = X + Y THEN GOTO 190
180 PRINT"NO, IT WAS" X + Y: GOTO 200
190 PRINT" CORRECT!": T = T + 1
200 NEXT I
210 PRINT"YOU GOT" T "OUT OF 10 RIGHT." ©
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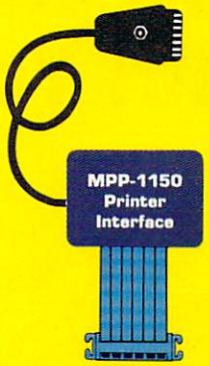

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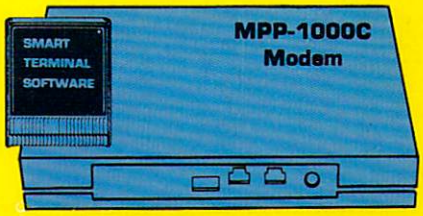

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How To Get Intimate With Your Computer

Part 1

Fred D'Ignazio, Associate Editor

In my September column I proposed that we move beyond computer literacy – to computer *intimacy*. I have done some thinking since then, and I have concluded that we shouldn't abandon our push for computer literacy, especially among young people. But we should encourage computer intimacy *before* computer literacy.

Computer Intimacy First

If you are intimate with your computer you are comfortable, cozy, even attached to it. You know enough to put the computer to work, but you don't have to know *how* it works. Computer intimacy is a totally new relationship between people and computers, one made possible by the new developments in computer hardware and, especially, software. Once we are intimate with our computers, many of us will also want to become computer literate. But not all of us. Nor will we need to.

Many adults envy children's relations with computers. The myth is that children are computer whizzes, that they are computer literate. But this is untrue. Most children are no more computer literate than most adults. What they are is computer *intimate*. They like computers. They have a warm, affectionate, and playful relationship with computers. They don't fear computers. They aren't overawed. To them the computer is just a snazzy appliance or toy, a cross between the TV set, the typewriter, the piano, and building blocks.

Children move rapidly toward computer literacy because they become intimate with computers first. This is the same path adults should follow. Adult computer courses make the mistake of skipping the intimacy part and moving right into computer literacy. But, in most circumstances, this strips computers of all their fun.

The first impression the average adult has of a computer is just as he or she imagined: the computer is technical, dry, and complicated. Adults know that it is for their own good to become computer literate, but that doesn't mean they want to. No wonder the adults look enviously at the children. The children look like they are having fun. For them, learning about computers is exciting, hilarious, and very rewarding.

But why should children have all the fun? For many adults, computer literacy is a huge roadblock that separates them from learning more about computers. We should clear away this roadblock and start adults in the right direction, and introduce them to programs modeled after children's programs, programs that promote computer intimacy.

Establishing A Balance

In the job market of the 1990s and the twenty-first century, very few people will be computer literate, if by literacy we mean having the ability to create real, nontrivial computer programs. Yet most

---

Fred D'Ignazio is a computer enthusiast and author of several books on computers for young people. His books include Katie and the Computer *(Creative Computing),* Chip Mitchell: The Case of the Stolen Computer Brains *(Dutton/Lodestar),* The Star Wars Question and Answer Book About Computers *(Random House), and* How To Get Intimate With Your Computer (A 10-Step Plan To Conquer Computer Anxiety) *(McGraw-Hill).*

As the father of two young children, Fred has become concerned with introducing the computer to children as a wonderful tool rather than as a forbidding electronic device. His column appears monthly in COMPUTE!.

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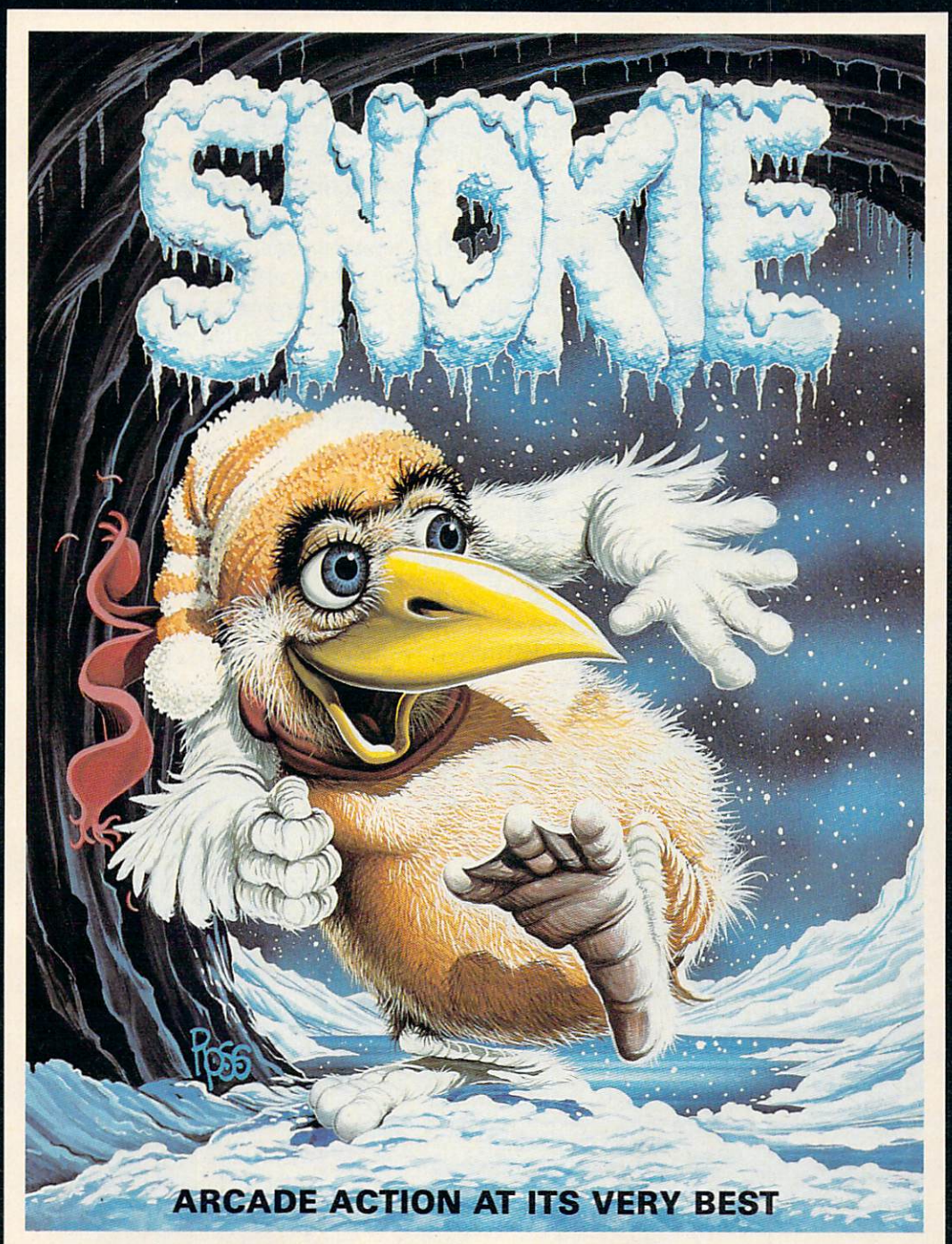

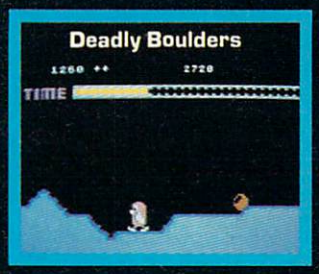

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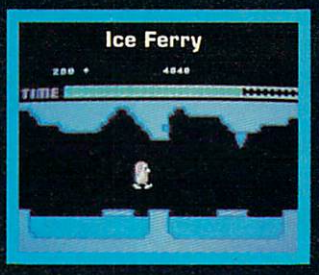

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people will need to be computer intimate. They will need to be able to work with computers – confidently, comfortably, efficiently, and sometimes even joyously.

But this doesn't mean we should abandon computer literacy. Computer literacy is not just a technical skill for a few mechanics and specialists. It is a doorway that many should enter. Then they can begin using the computer to its fullest potential. For people who are computer intimate and literate, the computer can become a medium for self expression, a "new age" culture for creativity and communication, and an environment for invention.

Children, especially, should be encouraged to move beyond computer intimacy to a higher level of computer literacy (appropriate to the sophisticated software tools that will be running on computers of the future). Many will not want to go, and they shouldn't be forced. *They will not need to be computer literate to live happy, productive lives in the future. Computer intimacy will suffice.*

However, as a social goal, computer intimacy is not enough, not if our culture is to keep evolving, changing, and responding to the challenges of the present and the future.

The Magician's Top Hat

How do we see computers? Today most children and more and more adults see computers as a magician's top hat. All the new software cartridges, disks, and tapes are stuffed inside the hat, like white doves, flaming scarves, brilliant-colored parrots, and soft, fuzzy bunnies. You can reach into the computer "hat" and pull out almost anything you can imagine – word processors, adventure games, file managers, video paintkits, turtles, and electronic pianos.

And the software industry is growing like a colony of healthy bacteria. In the future we will be able to pull a thousand times as much out of the magic hat.

But what fuels the software industry? What is its source of dynamic power and energy?

Computer literacy. Not among a handful of computer scientists and experts, but spread across millions of computers and millions of users. Computer literacy is the training ground for computer invention. And computer invention makes computer intimacy possible – at higher and higher levels.

Mass-produced microcomputers and increasingly sophisticated software tools have unleashed the imaginations and enlivened the ambitions of an army of youthful, would-be inventors. The inventors are firing off their software inventions like fish launched from a host of catapults

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Millions Of Computer Inventors

The personal computer is more than a magician's hat. It is also a miniature toolshed, workshop, or laboratory. And as personal computers become less isolated, and enable their users to communicate with each other, they will become a *roundtable*, a forum for people to bounce ideas off each other and then implement those ideas, jointly, as new computer software.

Computer literacy – appropriate to new, higher-level computer tools – is needed in the future, not just among a few experts but among thousands and millions of young inventors with fresh ideas and with the energy and self-confidence to turn them into computer inventions. And computer inventions will be woven into the fabric of our economy, our society, and our lives.

So computer literacy is necessary. All children should get a crack at becoming computer literate, at the youngest possible age.

Yet computer literacy still does not come first. Computer intimacy comes first, especially for the majority of adults who are scared to death of computers, yet realize that computers are the wave of the future. The strident cries for universal computer literacy only increase these adults' fears. For these adults, computer literacy is not the answer – at least not yet.

A New Religion

Computers are powerful new machines, so powerful that they are treated by many people as a new "religion." Computer enthusiasts are the evangelists for this religion, and they are winning converts by the millions.

Most adults, however, have mixed feelings about computers. They see computers for what they are. Computers are valuable tools and servants, but they are not the most important thing in life. Computers are not an end. They are merely a means to more important, human-defined ends.

Also, computers, like any other powerful and pervasive technology, are valueless in themselves. Whether their impact is good or evil depends on how they are used.

Most adults have a very healthy skepticism and distrust of computers, especially when the "true believers" market them as a necessity and tout them as a new religion.

Most adults do not need a startling plunge into the icy waters of computer literacy. First they need to get their feet wet. They need to follow in their children's footsteps. They need to play with computers, learn with computers, and have fun.

See "On The Road," page 140, for part 2 of "How To Get Intimate With Your Computer."

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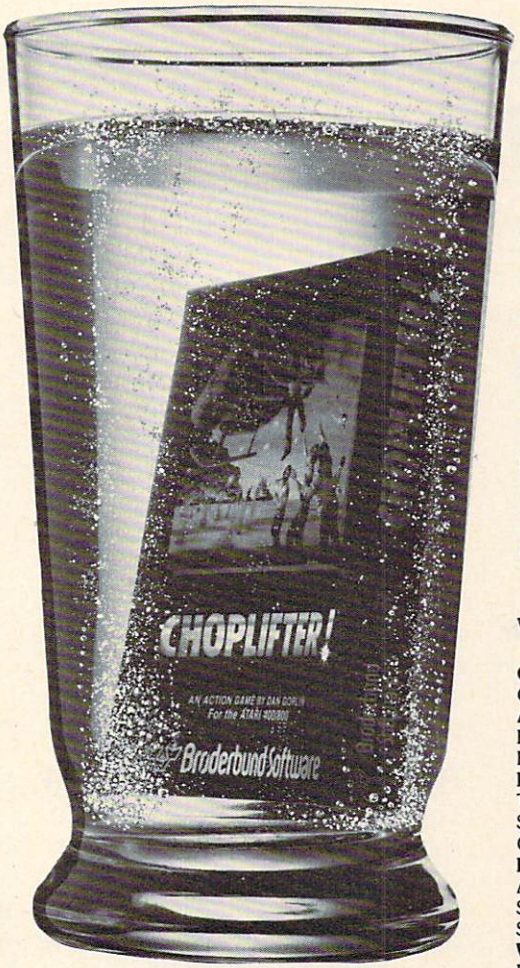

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Androbot's Topo

Michael A. Tyborski

Robots are rapidly becoming part of our life. You cannot read a magazine or newspaper without hearing about them. Although robots were once laboratory curiosities, they are now within anyone's reach.

Yes, *you* can own a robot. Mechanical servant? Not yet. Entertaining companion, yes.

Androbot, Inc., of Sunnyvale, California, has recently released its Topo robot. It will provide hours of entertainment for any Apple owner. Although not a true robot, it demonstrates many of the important fundamentals of robotics.

Your Computer Controls It

Topo is a radio-controlled platform that looks like a robot. It includes a user's manual, transmitter, and plug-in control card for the computer. It also includes TopoBASIC on disk, which allows it to be used within a few minutes.

An Apple computer controls Topo; this simplifies programming and reduces the selling price. It also eliminates the need to learn a new operating system or programming language. Unfortunately, your computer does not receive sensor information, a limitation that makes it possible for Topo to run into walls or down the stairs.

The robot is made of high-impact plastic and is three feet tall. Its friendly appearance attracts small children like ice cream, an effect consistent with Androbot's belief that robots should be "friendly looking, inviting companions."

Topo has a head and arms. Unfortunately, they are not functional. The head is permanently attached to the body and does not turn, which makes the robot less lifelike. It has a decorative face grill and eyes. An emergency stop switch is mounted on top of the head which turns off the robot.

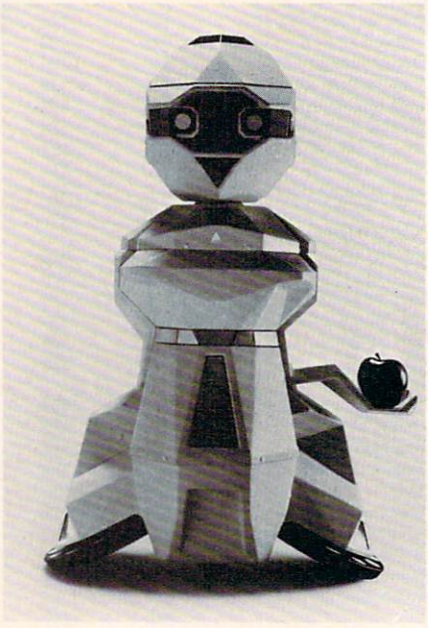
The arms, plastic flaps that can be extended as needed, are made from relatively thin plastic and cannot hold heavy loads. They attach to the body with plastic pins.

Two-Wheel Drive System

Topo has a unique drive system called Andromotion. Androbot claims that this provides "maximum stability and safety with optimum maneuverability and control." It also gives the robot an individual personality.

Just what is Andromotion? It is a two-wheel drive system that relies on angled wheels for stability. This design is patterned after the rocking chair. As a result, the robot remains stable because the effective roll center is above the center of gravity. The principle is clearer when the robot is viewed from the side. The side projection of the wheels looks like an ellipse, and the long sides resemble the rail of a rocking chair.

Because of Andromotion, Topo sways from front to back as it moves. This sway can become violent during a fast stop, making Topo look like a fishing bobber.



Androbot's Topo robot.

Androbot states that Topo has industrial-grade batteries and a fabricated steel superstructure, and claims that high-torque motors and cast aluminum gear boxes assure structural integrity. These features place the robot above the toy category.

The robot's back panel holds the power switches, indicator lights, and a charger jack. Yes, switches. For some reason, Androbot decided to use a separate ON and OFF switch, a design possibly based on a control circuit restriction. The red and green switches may also indicate STOP and GO to children.

The indicator lights show when Topo is on and what the battery status is. When a low voltage condition occurs, a red indicator light turns on. The wheel supports also contain indicator lights for showing direction.

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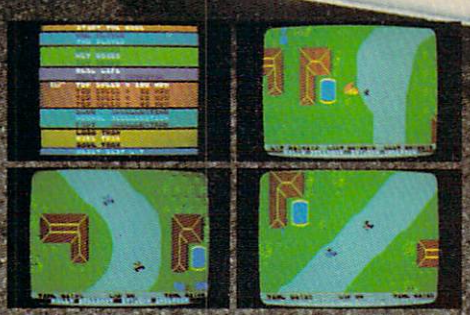

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You are responsible for plugging in the charger – a simple AC adapter. You must also prevent the robot from being turned on while charging. If it is, you may soon need a new charger. Finally, you must not leave the charger connected for more than 24 hours at a time.

Topo receives commands over a radio link. This link uses a 100-milliwatt, 4-channel AM transmitter that operates at 27.145 megahertz, and transmits the control card data. Although the antenna is short, a 90-foot range is possible. The transmitter has its own power switch to prevent interference when Topo is not being used.

The control card provides power and serial data for the transmitter. It plugs into slot five on the Apple computer. The unit has three integrated circuits and one regulator. This allows a 3-inch-square board to hold all the circuitry. An AMD 9513 chip generates the serial data for the transmitter.

The Documentation

The Topo manual is easy to read and understand. It comes in a small ring binder and includes dividers for future chapters. A plastic holder protects the program disk and warranty card. Interestingly, the manual was printed on a dot matrix printer, but this does not decrease its readability.

After an introduction to Androbot and Androbots, the user is shown how to unpack and check Topo. The first section also includes control card installation and battery charging instructions.

The important calibration procedure, which insures accurate movement and turning, is covered next. Finding calibration values for each surface Topo will move on will minimize errors from wheel slippage.

Finally, the last section describes TopoBASIC, and has material for the beginning and advanced programmer. This section includes a listing of the machine language and BASIC routines. It also provides a glossary of BASIC routines.

Topo In Motion

After charging the batteries, we began to use Topo under program control. This proved to be an interesting experience. Topo just did not like repeating its path. While drawing a square, for example, it turned about 15 degrees each repetition. This made the square rotate about its center.

Proper calibration improved its performance. In our case, the procedure took about ten minutes. It had to be repeated, however, for other surfaces.

The transmitter could control Topo throughout a house. It did have some annoying dead spots, however, which made Topo act erratically or stop.

Topo cannot detect obstacles. As a result, it often ran into people or furniture. This, in turn, changed its path or completely stopped it. Whenever this happened, it had to be stopped and moved to its starting point. The program was then restarted.

Spectator reactions varied. Adults and teenagers were either amused or skeptical. Many wondered what Topo could be used for. Young children, naturally, were a captive audience. They would try touching Topo whenever it stopped. Some even talked to it.

Having already seen Heathkit's Hero robot, many people missed voice and head movement, claiming that these features make robots interesting and lifelike. A few people also wanted the arms to move. Despite these objections, they all gave Topo a favorable rating.

Future Enhancements

Androbot will offer a number of accessories for Topo, including a voice module and Androwagon.

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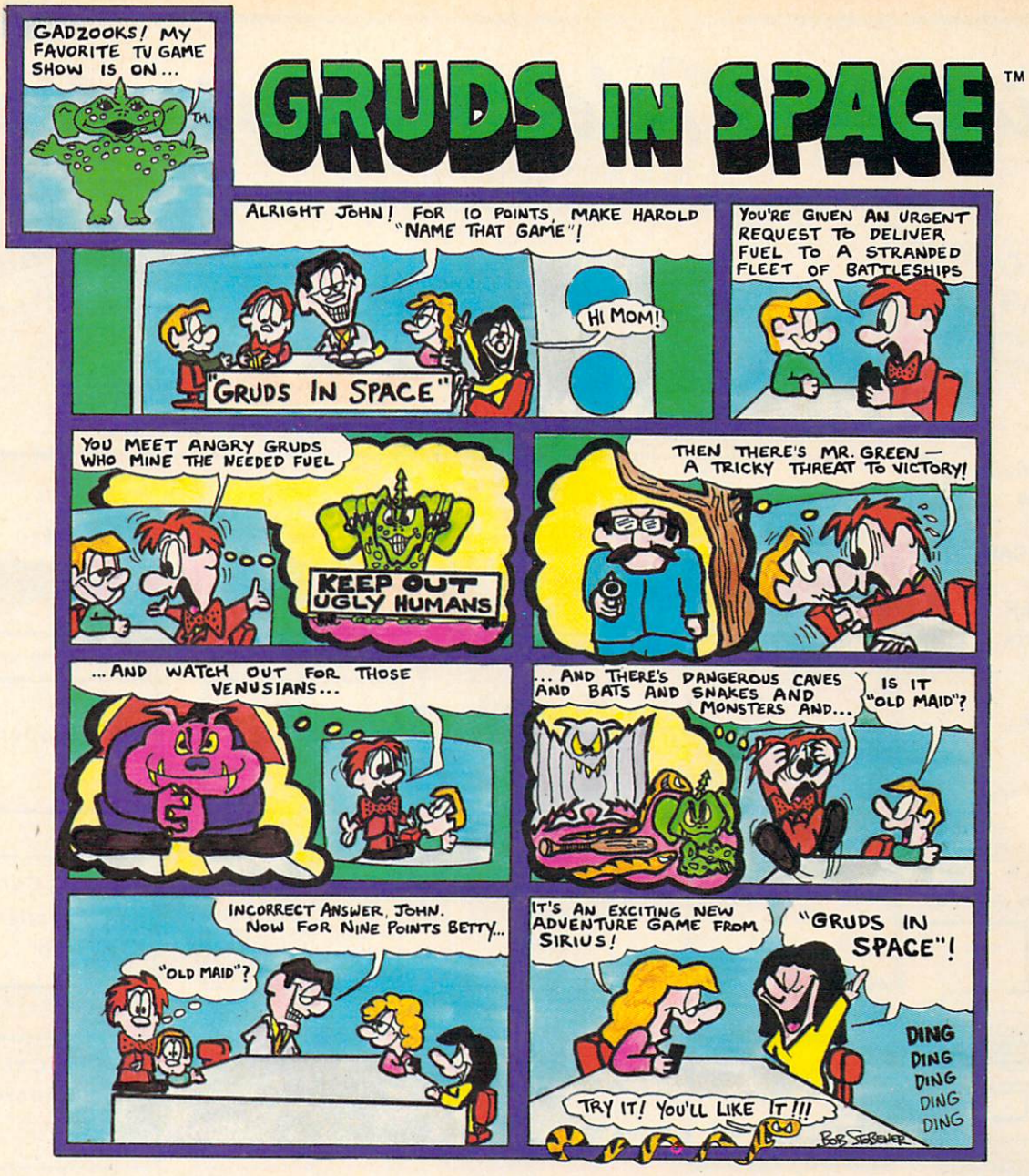

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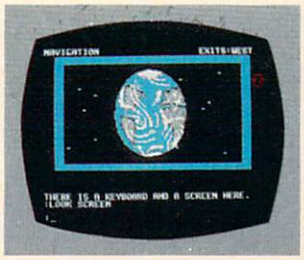

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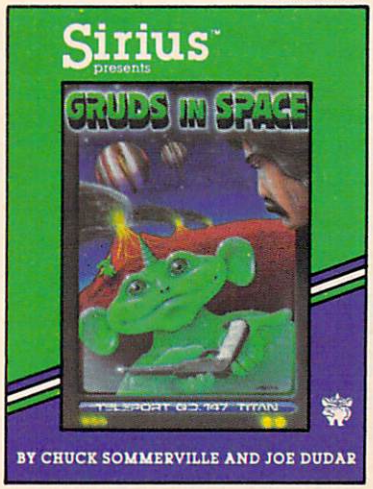

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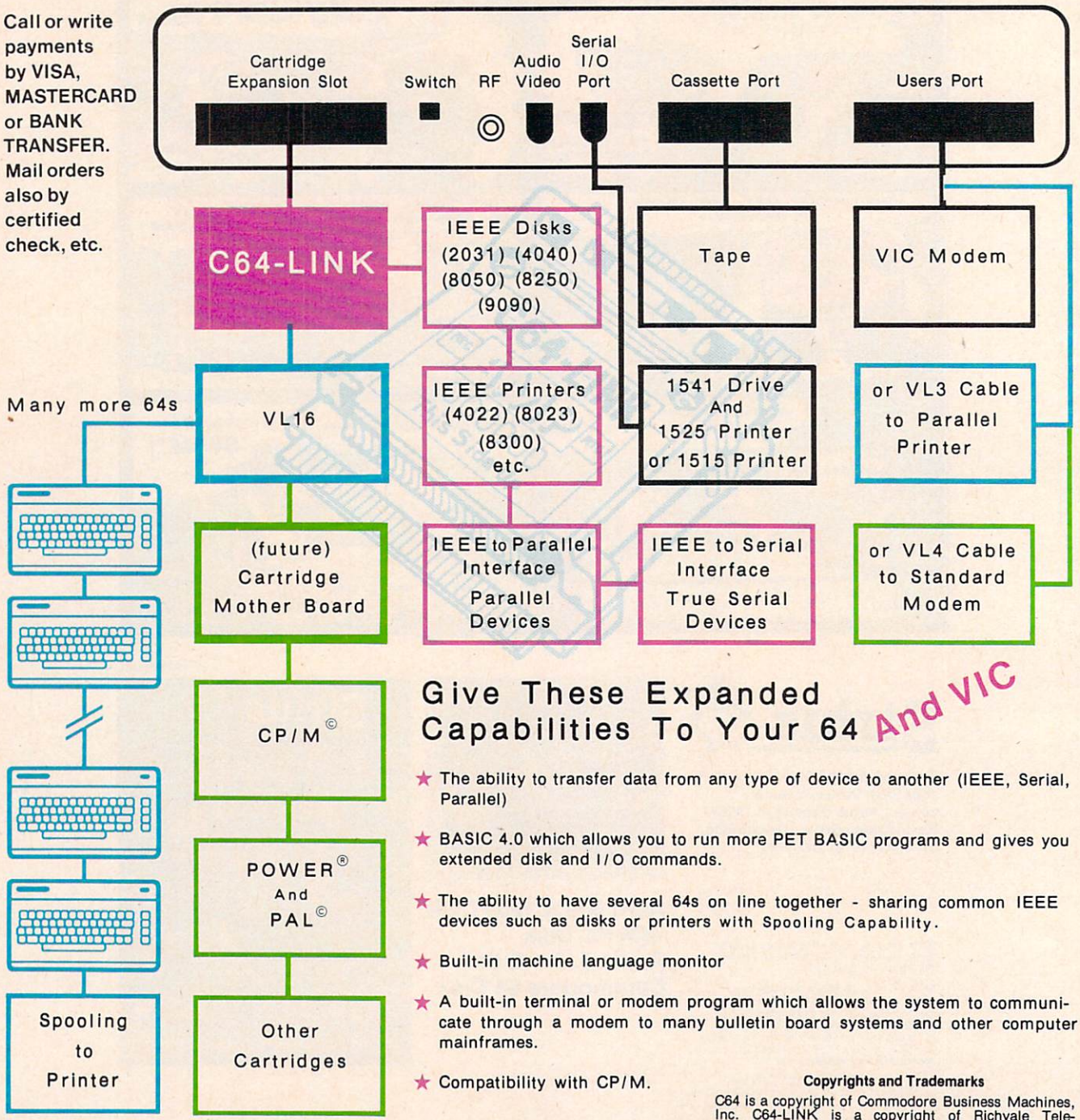

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The voice module will use a tape recorder for high-quality, low-cost speech. It will be controlled by a spare transmitter channel and should help attract spectators and hold their attention.

The Androwagon compensates for the cosmetic arms. It allows Topo to carry beverages and other heavy objects. When combined with speech, this accessory could turn Topo into a party host.

Programmers should look forward to working with TopoLogo and TopoForth. These languages simplify program development and allow commands such as GO KITCHEN. They also draw the path Topo is currently following. A TEACH mode saves time by allowing command sequences to be created and saved on disk for future recall.

TopoLogo consists of extensions to Terrapin and Krell Logos for the Apple II computer, and includes calibration and demonstration programs. This package provides the most powerful way to control Topo.

Finally, interface boards will soon be available for Atari, Commodore, and Radio Shack computers. This will undoubtedly make Topo more visible. Despite its limitations, Topo provides an excellent introduction to robotics.

Topo
Androbot, Inc.
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$795
$495 without sound ©

Paper Porter

Betsy and Stefan Burr

There's something particularly attractive about a simple, inexpensive device that claims to do the work of complicated hardware. That's what intrigued us about a piece of plastic called the Paper Porter, which is designed to give friction-feed capability to a tractor-feed printer such as the Epson MX-80. Since friction feed can add as much as $100 to the cost of a printer, this alternative, at less than $5, is worth considering.

The Paper Porter is a 9½-by-17-inch sheet of clear plastic with holes punched in the side so that it can be driven by tractor pins. Near the top is a pocket formed by another sheet, which can hold by friction an ordinary piece of paper, such as letterhead. Once the top of the paper is inserted into the pocket, the Paper Porter is easily loaded and run through the printer. The procedure is repeated with each page in a multipage document. With practice, we found that the whole operation takes only a few seconds – quite comparable to the time needed to run each separate sheet through a printer with friction feed.

Print On Letterheads Or Ditto Masters

Although printing on letterhead stationery may be its primary use, the Paper Porter can come in handy in other ways. For example, we use it to make ditto masters.

A minor difficulty arises in trying to print close to the top of a page. The plastic pocket overlaps the top of the paper by one inch, making it impossible to print above that point. We solve this problem by putting two small loops of masking tape, sticky side out, in the pocket. This holds the page so that printing can start within half an inch or so of the top. After you put the tape in place, you may need to reduce the stickiness a bit. Double-stick tape works, too, but it's a trifle harder to adjust the stickiness. Once the tape is properly placed and adjusted, the fix lasts for months.

On letterhead stationery, of course, there is no need to come near the top of the page, so it can be useful to have one Paper Porter with the tape and one without it. We've ended up acquiring two of each type, so we can be slipping one page into a Paper Porter while the other is printing – a timesaver on multipage jobs.

The 17-inch length is just enough to prevent the out-of-paper switch on the Epson MX-80 from terminating printing before the bottom of an 11-inch page. An earlier version of the Paper Porter was too short, making it impossible to print to the bottom of a page unless the switch had been defeated. With paper longer than 11 inches, and perhaps with some other printers, the alarm may still be activated. And, just as with some platen feed arrangements, the alarm may come on when pages are being changed. For these reasons, it may be desirable to defeat the switch, which is not usually difficult. On the MX-80 it can be done by taping a small piece of paper over the switch.

Business Envelopes Not Compatible

The Paper Porter does have one significant drawback: it can't print on a standard business envelope. Any paper that is even slightly wider than 8½ inches will interfere with the tractor pins.

There is at least one trick which is actually easier with the Paper Porter than with a typical friction (platen) feed printer – printing two or more columns in perfect alignment. The standard procedure is to print one column, then back up the paper and print the second column. With friction feed, the alignment is tricky, but with tractor feed, the pins guarantee that the backed-up page can be perfectly aligned with no trouble.

The Paper Porter
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Home Computer Games Grow Up

Orson Scott Card, Editor, COMPUTE! Books

I must admit it took me by surprise. After months of observing that almost no one was making true home computer games, suddenly I find myself with a fistful of games that are everything I could ask for.

And I do ask for a lot:

1. A home computer game should not be designed to minimize playtime – it should not be designed to take away quarters by making the game impossible to beat.

2. It should use the full power of the computer – it should do things that only the computer can do well, and it should use all the appropriate resources the computer provides.

3. It should be an excellent *game*, not just excellent *programming* – the play itself should be exciting and not serve merely as an excuse to show off the programmer's expertise.

4. Above all, the game should be designed so the player controls and, to some degree, creates the game as he plays – I have little patience with games that play *me*, forcing me to follow only one possible track or learn one mechanical skill if I hope to win.

If those requirements sound like what you want, too, I have good news for you: there are finally some software companies making a serious effort to create exactly this kind of game.

The software firm Electronic Arts has added a fifth requirement for itself: The game must be truly original. No *Donkey Kong* or *Pac-Man* clones in this group of games. Even though each of their games has roots in gaming traditions, the object has not been to recreate a favorite board game, or duplicate a sport, or translate an arcade game.

A Colony In Space

After years of spaceships blasting away at each other, Electronic Software's *M.U.L.E.* (for Atari and Commodore 64) is a refreshing change. In this game by Dan Bunten, Bill Bunten, Jim Rushing, and Alan Watson, you and three other colonists (human- or computer-controlled) have been left to mine for Smithore. However, you also have to produce enough food and energy to survive until your ship comes back in six months. To help you, you have an all-purpose robot called a M.U.L.E. – which can be as stubborn as its flesh-and-blood namesake.

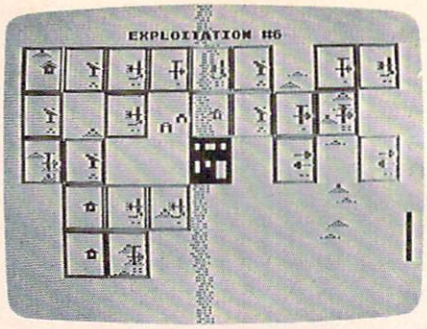
This leaves you with some complex decisions to make. While you are competing with the other players, trying to make a killing in food production, Smithore, or energy, you also have to cooperate with them, so you don't overproduce one commodity and lower the price – and so you don't neglect to produce enough food and energy to keep the colony alive.

In other words, it's a game that faces the fundamental ethical dilemma of humanity, while teaching you, firsthand, the principles of economics. Sounds deadly, doesn't it?

It's Serious Fun

But deadly it is *not*. From the opening cartoon and the funky theme music, you know that *M.U.L.E.* is going to be fun. At the start of the game, you get to choose a creature that will be your player-figure. Your choice of creature can challenge advanced players and give a boost to beginners – and the descriptions and pictures of the creatures are fun.

Once play begins, each



In M.U.L.E., *from Electronic Arts, you try to get your plots to grow as much as possible.*

"month" you and the other players each select a plot of land to develop. Then you take a trip into town, buy a M.U.L.E., and outfit it for the type of production you're planning. Then you get it back to your property and install it, hoping the M.U.L.E. doesn't malfunction and run away during the trip.

When the month ends, you have produced a supply of food, energy, and Smithore. All the players go to the company store to buy and sell. There you bargain until you agree on a price for your commodities. If something is in short supply, the price will probably rise; if there's a lot of it, you can only sell it at minimum. If you mined Smithore and Smithore is selling low, and you need to buy food, which is in short supply, you lose money. The player with the food, however, does rather well. After the auction is over, the computer tells you your current net worth, and you go on and add a new plot of land to your holdings.

There are other elements to play. Wampus hunting and pub crawling can use up the idle moments after your M.U.L.E. has been installed; natural disasters like acid rain, pest attacks, planetquakes, and a fire in the company store can complicate things.

In all this, you never touch anything but the joystick. Going to town and getting your M.U.L.E. outfitted is all joystick-controlled animation; natural disasters happen on

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screen, with well-done graphics; and the auctions are choreographed like a Virginia reel, with buyers and sellers stepping forward and back, forward and back, raising and lowering their price until they finally come together and agree. Even your supplies and M.U.L.E. installations are graphically represented.

And your shambling, lazy, stubborn M.U.L.E. is a masterpiece of animation with style.

Fantasy Chess

Strategy and conflict games, in the days before computers, always had a problem: time and realism. The more realistic the game is, the more tedious it gets, moving little army pieces or keeping track of how many wounds your character has sustained. And the less realistic the game is, the more frustrating it is when your well-planned attack is wrecked by a streak of unbelievably bad rolls of the dice.

Some games, like chess, simply ignore realism: in each individual battle, the attacker always wins. Others, like *Diplomacy*, ignore tactics and move the game to the level of negotiations, where you quickly find out how untrustworthy your friends are.

With *Archon: The Light and the Dark*, by Anne Westfall, Jon Freeman, and Paul Reiche III, the computer lets the gamer have it all. The game is played on a chessboard – but *this* board isn't all light and dark squares. About half the squares cycle through various colors, from light to dark and back again. If you're the dark player, your icons (pieces) have much more power on dark squares, and are weaker on the light ones; this gives you a powerful advantage when the majority of the squares on the board are dark.

The icons each have different powers, and move in different ways. Your leading icon is either a wizard (light) or a sorceress (dark), which has a repertoire of powerful spells, each of which can be cast only once. Other icons can walk, fly, or teleport a certain number of squares in each turn.

When your icon moves onto an enemy square, you don't just take the square. You have to fight for it. The square immediately expands to fill the entire screen, and your two icons meet in mortal combat. Some are infighters, and must move in close; others fire missiles at various speeds; others have an aura which wards off enemy blows and damages the enemy when it gets too close. If the battle is fought on a dark square, the dark icon has much greater endurance; on a light square, the light icon has the advantage. The action in the battle is as exciting as any arcade game.

And when the battle is over, the victor has the square – unless evenly matched icons destroyed each other.

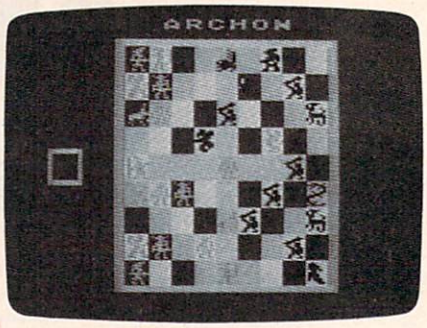
As with chess, it takes a while to learn all the icons and their various strengths, and it takes more than a little agility and practice to master the techniques of battle. But if it were too easy, it wouldn't be fun.

The computer player is very, very good. I suggest you learn this game with an evenly matched friend – it'll be a while before you can give the computer a run for its money. *Archon* is available for the Atari, Apple and Commodore 64.

Training Your Pieces

Worms, by David S. Maynard, is that rare thing: an entirely new game, which is not only fun to play, but fascinating, often beautiful to watch. The idea of winning is almost secondary to the sheer pleasure of watching the game play out on the screen. Versions are available for Atari and Commodore 64.

Four "worms" of different colors are at the center of a dot-filled screen. The worms are



Archon, *from Electronic Arts, is a fantasy chess game with fast-action battles between pieces.*

really lines, spanning the gap between two dots. Each dot can have up to six lines radiating from it. When all six possible positions are filled, that dot and all the lines radiating from it become the color of the worm that finished filling it. You only get points for the dots you fill. When your worm runs into a place from which there is no escape – no unfilled dot to move to – it dies. When all worms have died, the game is over, and the winner is the player whose worm has finished the most dots.

The best feature of *Worms*, though, is that instead of controlling every choice your worm makes, you actually *train* your worm. There are dozens of possible configurations for each dot your worm might come to – different numbers of lines already drawn, in different places, combined with the six possible angles from which your worm might have approached the dot. When you are training a new worm, each time it reaches a configuration it hasn't seen before, the game stops for a moment while you decide what direction the worm should go. Once you've decided, from then on it will *always* make that choice whenever it sees that identical configuration.

After a very short time, your worm doesn't stop at all – it is fully trained, and continues to do everything you trained it to do. If your training was good, it will finish many dots; if your training wasn't so good, it will either tie itself in a knot and die,

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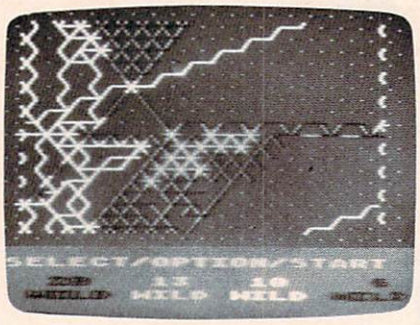

Train your worm and watch it compete for survival in Worms, *from Electronic Arts.*

or string itself out all over the screen, never finishing dots at all, just leaving long trails for better-trained worms to come in and finish.

In other words, you create a creature that seems to be alive. You can save worms, too, and use them again. The computer can also generate worms according to several possible parameters. And when the worms are fully trained, you can sit back and watch them make their patterns on the screen. At the fastest speed setting it's as exciting as a hotly contested race; at the slower speeds, it is fascinating to study the geometric patterns as the designs unfold.

Seeds and Spacewalking

Jaron Lanier's *Moondust* Creative Software cartridge for the Commodore 64, like *Worms,* is a highly original game concept that could not exist without the computer. With a single joystick, you control a spacewalker *and* several "moondrop ships" with the same motion. When you make them turn, they move in gradual curves rather than sudden angles, and since they leave a trail of gradually fading moondust behind them, the screen display is graceful and strange – a world you have never visited before. Add to this the haunting music, and *Moondust* is fascinating to play for the sheer beauty of it.

It's also fun. You must maneuver your spacewalker away from the center of the screen, where he leaves a single seed at the spot you choose. After that, you must maneuver the ships to pass over the seed. Each time they pass over the seed, they draw a trail of seed squares after them. You must try to draw the trail of seed squares until they reach the center of the screen; when they do, the energy field dances. However, the seed can only be drawn out into a limited number of squares, and if you haven't reached the center in time, the game ends. And each time the spacewalker collides with a ship, he gets bashed; too many collisions and he is knocked right out of the game.

Like the Electronic Arts games, this is a home computer game. It would never make it in the arcades. The very things that make it so good – the smooth and ballet-like movement, the gentle mood of the music, the original, challenging, thoughtful play system – would all be lost next to razzle-dazzle games. This game will make you glad you bought a home computer.

A Musical Toy

When children start playing around with music, the results can be awful. Endless scales and practice songs, sawing at a violin, pounding at a piano, blasting down walls with a trumpet – parents of children who are learning music deserve medals.

Wes Horlacher's *The Magic Melody Box,* available for Atari from APX, takes all the pain out of a child's first experiments with music, and helps children learn to visualize pitch and duration.

At the beginning of each new tune, you are asked to decide how *fast* and *slow* you want your tune to be. Those words are deceptive – you aren't choosing speed so much as you are choosing a rhythm, a pattern of note durations ranging from whole notes to eighth notes, with some more complex rhythms in between.

Once you have chosen, an orange box appears on the screen, with the rhythm graphically represented below it. You start at the left side of the box and, with the joystick, draw a line to the right. You can move the joystick up or down to raise or lower the pitch; the longer your line stays on one pitch, the longer your finished tune will play that note.

When you reach the right-hand edge of the screen, your tune is finished. While you listen, the program makes several quick, soft passes through your tune. The wait is worth it. When your tune plays again, the program has added harmonies that turn it into a full four-voice arrangement, four measures long. Your tune plays twice; then a computer-generated interlude varies your theme for four measures; then your tune plays again.

Musical purists will probably scream about "manufactured" harmonies. I can only answer that the results here are not tin-can standard progressions: the harmonies are fully responsive to the notes of your tune. The variation in the interlude is mathematically, and musically, derived from your melody. And the result is truly enjoyable music which is nevertheless under your control to a surprising degree. And the two-dimensional method of *drawing* a melody helps children visualize pitch much more effectively than does the confusing musical staff.

The Magic Melody Box isn't good just because it makes children's experiments endurable, though that is certainly a virtue. In fact, while I enjoyed my children's music and the hours of delight they got from it, I got even more pleasure from experimenting with it myself. I've composed music and played several instruments, and *The Magic Melody Box* certainly doesn't replace the orchestra, but it *does*

use the computer to remove many layers of theory and many hours of practice which usually stand between the creative impulse and the aesthetically pleasing sound.

I wish other programmers would learn from Horlacher's deceptively simple virtuoso music program: the value of computer sound is not confined to sound synthesis. In fact, the computer can and should be used to remove barriers between the would-be musician and his music. This program reminds you why producing music is called "playing."

What do these games have in common that makes them excellent? They are original; they do what they set out to do very, very well; they allow the player to take part in the creativity; they do things that only computers can do.

Above all, though, is the fact that I didn't want to stop playing. And when I wasn't playing, I didn't want to stop watching other people play. That's as good a definition of *fun* as I can think of.

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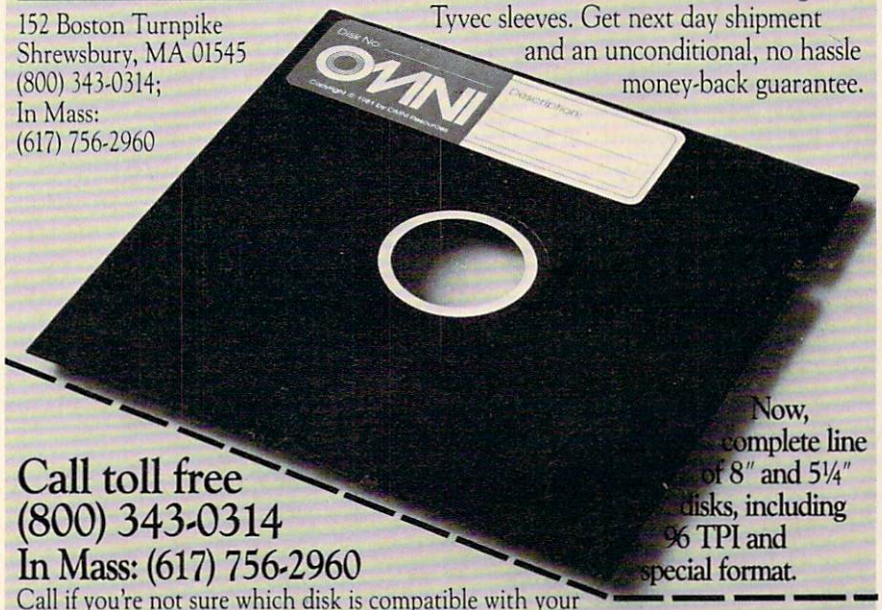

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The Timex/Sinclair 2040 Printer

Seth McEvoy

When Clive and Ian Sinclair designed the $99 computer, the world was truly amazed. Sometimes lightning does strike twice, because they've done it again, with a $99 printer.

As you would expect from Timex, the company that markets Sinclair's computer in America, this printer is small, inexpensive, and works perfectly when you take it out of the box.

What will the Timex/Sinclair 2040 Printer do? First of all, you can make a printed copy of your own BASIC programs. This can save you hours of trying to read your program off the TV screen, no easy task since the screen can handle only 22 lines at a time. Second, if you have created a picture on your screen with Timex/Sinclair's graphics, you can make a copy of that picture on the printed page. Third, it will print individual characters on the page, for simple word processing programs.

The 2040 is a particular kind of *dot matrix* printer. Each letter is printed by little wires that move, creating the letters by electrical charges that "burn" holes in a special paper. Each letter is made from a grid of dots, eight dots high and eight dots wide. The line length of the printed page is 32 characters across.

Setting It Up

After unpacking the printer, all you have to do is plug the printer cable into the back of the computer. If you have a RAM pack, you can plug the cable in between the computer and the RAM pack. The printer comes with its own 24-volt power supply, which plugs into any 110-volt wall socket.

Be careful, however, when connecting the printer. If you plug in the printer *while the computer is on*, the sudden rush of electricity could overload one of the integrated circuits. Also, if you attempt to print anything before you load the paper, it could damage the printing mechanism.

The printer has simple controls – an ON key and an OFF key. You can also test the printer by pressing the OFF button while pressing the ON button. If the printer is working correctly, it will print rows of 1's and 8's until you stop it by pressing OFF again. Furthermore, you can advance the paper by pressing ON, if the printer is already ON.

Unfortunately, the printer does not have a light to warn you when the power switch is on. The motor heats up a great deal, and if the printer is left on a long time, it may wear out some of the components.

Timex supplies one 82-foot roll of paper, 4 inches wide. Further rolls of this special thermal paper should be available from Timex dealers at $2 a roll. Timex cautions you not to buy any other kind of paper, but the HP-85 computer from Hewlett-Packard uses the same kind of paper. Since the paper from Timex has a red strip to warn you when you are near the end of the roll, you're safest using Timex paper. (Perhaps you could ink the inner part of one end of a non-Timex roll with a red felt-tip pen.)

Making It Work

Using the printer is easy. You can use three special commands already built into Timex/Sinclair BASIC: COPY, LLIST, and LPRINT.

COPY is used to transfer whatever is on the computer screen to the printer. You may type it directly (by pressing the Z key) or it may be part of a program.

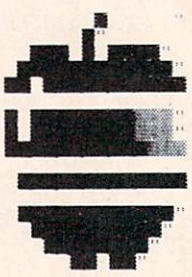
The figure shows what a digitized apple looks like on the printer. The picture was first "printed" on the screen (using the PRINT command) and then copied to the printer using the COPY command.

That apple was printed by using inverse spaces (Graphics key and Space) and shaded squares (Graphics key and Shift H).

If you look closely, you will notice that the tiny squares that make up the picture, such as the top of the apple stem, are not exactly square. You can also see the individual wire tracks across the picture. However, for $99, this is quite acceptable. The person who buys a Timex/Sinclair computer is not likely to want to spend $1000 for a high-resolution dot matrix printer.

Here is the program that was used to print the apple picture to the TV screen. We can make a copy of the program (listing) by typing LIST (Shift G).

```
  5 REM
 10 PRINT "    ILLUSTRATION 1    "
 15 PRINT
 20 PRINT
 30 PRINT
 40 PRINT
100 PRINT "                      "
120 PRINT "                      "
130 PRINT "                      "
140 PRINT "                      "
150 PRINT "                      "
160 PRINT "                      "
165 PRINT "                      "
170 PRINT "                      "
180 PRINT "                      "
190 PRINT "                      "
195 PRINT "                      "
197 PRINT "                      "
200 PRINT "                      "
210 PRINT
215 PRINT
220 PRINT "    A IS FOR APPLE    "
300 COPY
400 STOP
```



Apple Picture by Laurie Smith

LLIST will print out whatever BASIC program is currently in memory. If you have a long program, it will print out the whole thing in one long roll.

Suppose you have a different application, say a simple word processor. You can use the LPRINT command to print individual letters on the printer. The computer waits until the entire line is ready, and then it prints your line.

The following program

prints all the letters, numbers, punctuation, and graphics characters that the Timex/Sinclair computer has available:

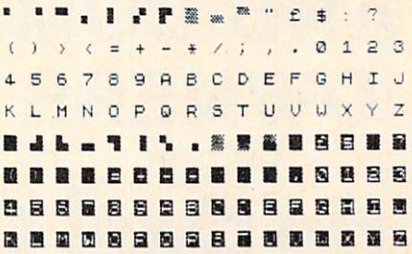
```
   4 REM
   5 LPRINT "
"
   6 LPRINT
   7 LPRINT "   PRINTABLE CHARAC
TERS"
   8 LPRINT "   ON THE TIMEX 204
0 PRINTER"
   9 LPRINT
  10 LET A=1
1000 LPRINT CHR$ A;" ";
1010 LET A=A+1
1020 IF A>63 AND A<128 THEN GOTO
 1010
1030 IF A/16=INT (A/16) THEN GOT
O 1100
1040 IF A>191 THEN GOTO 1090
1050 GOTO 1000
1090 STOP
1100 LPRINT
1110 LPRINT
1120 GOTO 1040
1130 STOP
```

This program is fairly simple. The only odd part is in lines 1020 and 1040. Since the Timex/Sinclair stores all its BASIC commands as single numbers, we want to make sure that those commands (RUN, GOTO, etc.) are not printed. We already know what their letters look like.

When you run the program, this is what it should print out:

ILLUSTRATION 3

PRINTABLE CHARACTERS
ON THE TIMEX 2040 PRINTER



Other Features

The Timex/Sinclair printer is relatively fast, printing at a rate of 50 to 80 characters per second. It will COPY a full 24-line screen to the printer in less than 11 seconds. It is much quieter than most dot matrix printers, making a whirring noise not much louder than a tape recorder rewinding.

This printer will be greeted with enthusiasm by serious Timex/Sinclair computer users. Writing programs without being able to print out listings has been a problem, since you could only view 22 lines of your program at a time. In a very long program, it seemed to take hours to find a particular line. Also, being able to print out the unique graphics of the Timex/Sinclair is a plus.

An earlier version has been available in England for quite some time, but the new 2040 has been changed to work with American voltages and it uses a better grade of thermal paper.

Once again, Sinclair is to be congratulated for inventing something smaller and less expensive than anyone else. Timex is to be congratulated for bringing it to America, and for energetically supporting their products. This printer fits in well with the Timex/Sinclair philosophy – it does the job without frills and without great expense to the consumer.

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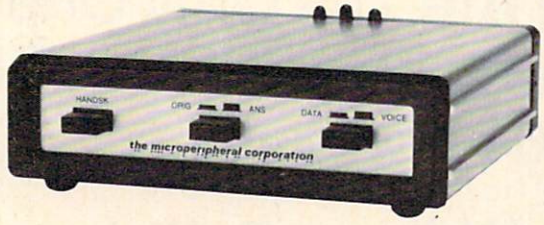

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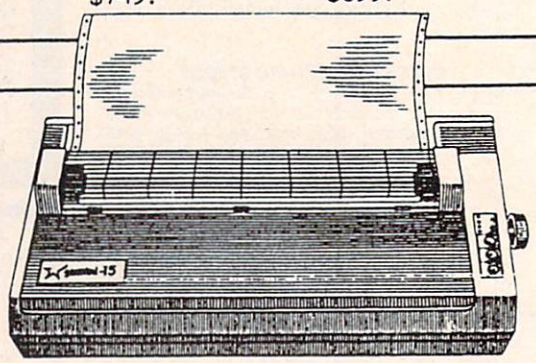

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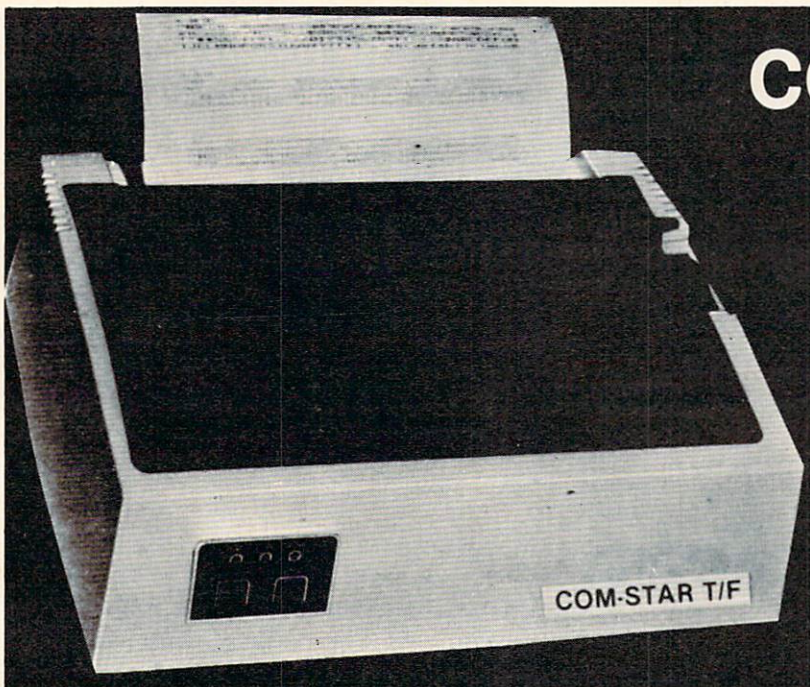

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Commodore Files For Beginners

Part 1

Jim Butterfield, Associate Editor

In Part 1 of this article, Jim Butterfield explains what files are and how to create them on either disk- or tape-based systems.

A computer can maintain files. They are something like the files we can keep in a filing cabinet. We may add information, remove items, change data, or just look at what's in the file.

Let's take a look at how we can create and recall information within files. Our examples will be Commodore-oriented (PET, CBM, VIC, and 64), although the principles generally apply to all computers.

The examples here involve tape or disk files. However, we won't use a special type of disk file called a *relative* file. Instead, we'll stay with *sequential* files, which are simpler, often more useful, albeit less powerful.

Ground Rules

A file is stored on disk or tape as a series of magnetic impulses. Once we have stored information in a file, it will stay there until we remove (or "scratch") it.

If you want to change a sequential file through additions, deletions, or changed data, you must create a new copy of the file containing these changes. You can't change the old file as it stands. This apparent limitation can often prove to be an advantage, however: it encourages users to keep old files as historical data or as a backup resource.

Files are similar to programs in many ways. We save both programs and files on disk or tape. Both contain data. Apart from the obvious distinction, there's a difference in usage between programs and files: files often change, programs seldom do so. As an example, a program to record student marks shouldn't need changing once it is checked out unless the school changes its procedures significantly. But the file changes from class to class, from test to test.

Programs read and write files. But files don't belong to a single program. A file of student marks might be used by several programs such as an updating program, a report printer program, and a statistical analysis program. Similarly, programs often are not locked in to a fixed set of files: a program which updates student marks might be used for several different subjects, classes, and grades, each of which would have a distinct set of files.

File Components

The elements of a file aren't hard to recognize. A *file* is a whole collection of information on some subject; it's like a file folder in your desk. A *record* is information on a single person, place, or thing. We use these words in English conversation: "This is a file of all my books; I have a record of every book I own." Within each record, a *field* is an item of information – for example, title, author, publisher, date published, price, etc.

When you're planning to set up a computer file, it's very important to work out, in detail, what fields each record will have. If you forget one, it will be a tough job to add the information later. Also, planning your fields will give you an idea of how many characters will be in each record. Multiply this by the number of records you expect to have, and you'll be able to estimate the amount of disk space or length of tape that the computer will need.

First File Mechanics

In order to read or write a file, your program must go through three distinct phases:

1. The file must be OPENed. We must give information on such things as: what physical device (disk or tape); what the filename must

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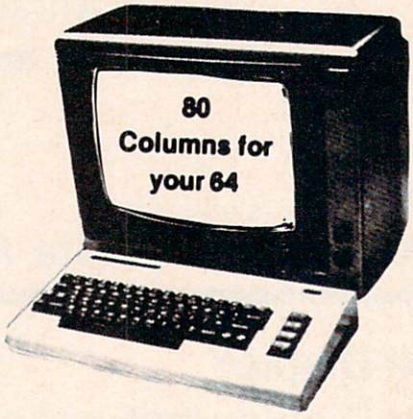

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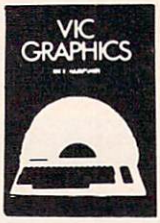

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be; and whether the file is to be an input or output type. This is the only time we give any of this information. In addition, we give this file a reference number, called a "logical file number"; this is the only number that we will use in the following commands.

2. We may write to the file (using PRINT#) or read from the file (using INPUT# or GET#) as much as we like. We identify the file only by its logical file number.

3. Finally, the file must be CLOSEd. This winds up activity on this file, unless we OPEN it again later. Once again, we identify the file only by its logical file number.

Note that the first step (OPEN) is the only time we deal with the details of what kind of a file is involved. Once the file is open, we never again mention whether it is disk or tape, or some other device for that matter. If we were reading a program and saw the statement:

```
PRINT#5,"HELLO"
```

we would not know whether the output was going to tape, disk, printer, modem, or other device until we backtracked and saw what the OPEN 5 statement said.

This turns out to be a good thing. With minor changes to a program – just in the OPEN statements – I could redirect output to any device I chose. This makes programs flexible and can help in the debugging process when you are writing the program.

Now that we've seen some of the rules, we're ready to go ahead and write a data file.

First Planning

Let's plan a simple file for students.

Our fields will be: surname, student number, and mark. That's not much, but it will show the principles involved.

We estimate sizes with:

```
Surname:        15 characters maximum
                 8 characters typical
Student number:  4 characters
Mark:            3 characters maximum
                 2 characters typical
```

Average record size will be 8+4+2, plus 3 (one RETURN character for each field). Total record size is then 17; we think we may have 200 students maximum, so we estimate the file size at 3400 characters (3.4K memory; about 14 disk sectors at 254 bytes per sector; about 18 tape blocks at 191 bytes per block which will take about a three-minute length of tape). We will not be writing 200 student records for our example, of course.

A First Run

To create the file, we would normally write a program. We'll do that later as part of a review; but let's write this file using direct BASIC statements. This way, you can watch as the file comes into being. Do be careful – an error message during the creation process could wreck our file.

Our first step is to open the file. If you have disk, type:

```
OPEN 1,8,2,"0:STUDENTS,S,W"
```

If you have tape, type:

```
OPEN 1,1,2,"STUDENTS"
```

The disk will whirr, or the computer will display PRESS RECORD AND PLAY. Obey the instructions, and let's talk for a moment about what we have typed.

In either case, we have opened a file using a working number (logical file number) of 1. That's the only information we'll use for the remainder of this exercise. The second number is the device: 8 for disk, 1 for tape. The third number has a different meaning for disk versus tape. On the disk, this is called a "secondary address"; we pick an unused number from 2 to 14 and "give" it to the disk for its internal use. On tape, this is called a "command"; a value of 2 instructs the computer that this is a write file, and will be the last file on this tape (an "end of file" block will be written behind the file).

The name of the file is STUDENTS; this information will be written into the disk directory or the tape header block. For disk, we must give extra information: a prefix of "0:" to indicate if necessary that this file should be written on drive 0; and a suffix of ",S,W" to signal that this is to be a sequential type file, and it will be written, not read.

We've opened the file, but we have written no data. Let's do that.

Writing The Data

Type (carefully) the following commands:

```
PRINT#1,"SMITH";CHR$(13);
PRINT#1,"3487";CHR$(13);
PRINT#1,78;CHR$(13);
```

These are the three fields of a student record. *Important:* Do not put a space after PRINT since PRINT# must be typed as one block; and don't forget to use a semicolon at the end of each line.

The CHR$(13) character is a RETURN character; we use it to signal the end of each field. We are better off not typing just PRINT#1,"SMITH" since an extra character called a *linefeed* might sneak its way in there and cause trouble later.

The name SMITH is a string, of course. So is the student number – even though it's numeric, we will never want to do arithmetic on it. The student mark is a genuine number, however, since we may want to compute high scores or

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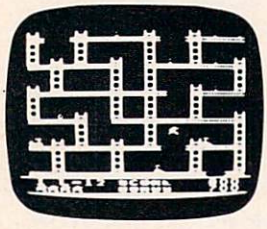

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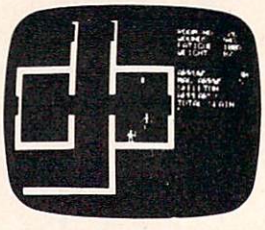

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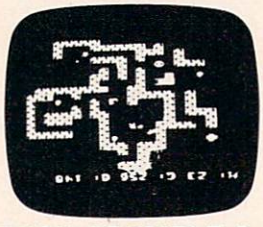

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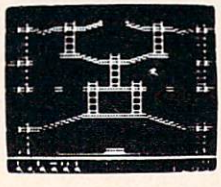

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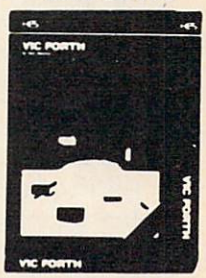

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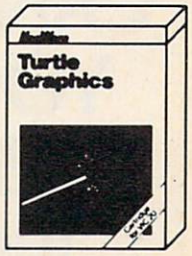

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averages. So it's not written or read as a string (no quote marks).

I prefer printing three fields with three lines. It seems to me that they stand out better. But you can print everything in one line. For variety, let's write our second student record that way:

```
PRINT#1,"WONG";CHR$(13);"3921";"CHR$(13);72;
  CHR$(13);
```

The information is harder to read, but it's all there. Remember the semicolon at the end.

One more student, and we'll wrap up our file. Again, let's use a slightly different method to show variety:

```
X$=CHR$(13):PRINT#1,"BLOGGS"+X$+"3985"+
  X$;77;X$;
```

We've done two things here: by setting X$ equal to our RETURN character we've saved a little typing in the PRINT# statement; and instead of using semicolon punctuation, we've used the + sign for concatenation where we can. No real difference either way. But don't forget the semicolon at the end.

Wrapping Up

You may have noticed something odd: when you typed in each student record, there was no activity. The disk did not spin; the tape did not move. Why? Because the characters are stored in a buffer (an area of the computer's memory) until there are enough of them to make it worthwhile writing to tape or disk.

We must close the file, or the data won't be written. So let's type:

```
CLOSE 1
```

and our file is complete. Next month, we'll see how to read it. ©

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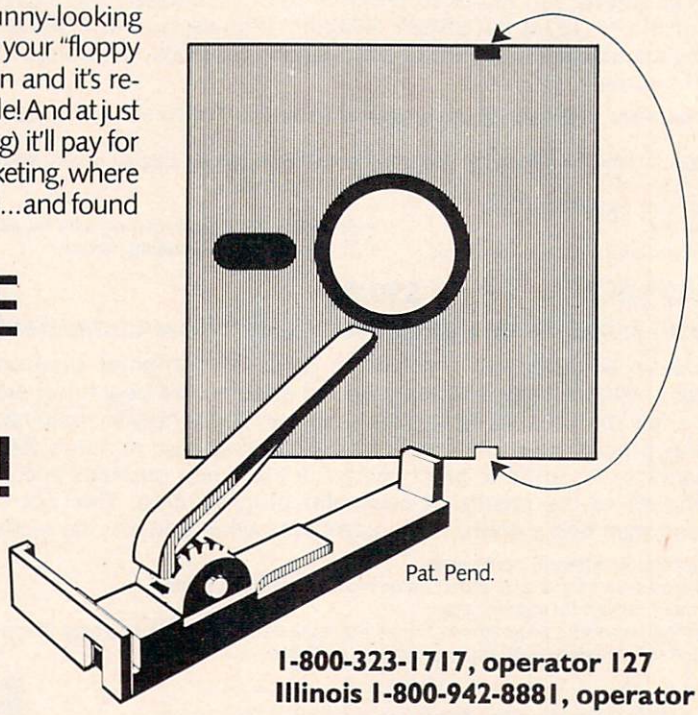

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Atari Disk Detective

D. G. Denby

A helpful disk utility for Atari owners, this program searches your disk and locates any user-specified string (hex or ASCII). It's especially useful for file recovery.

"Disk Detective" is a utility program that will appeal most to the advanced programmer, but will also prove useful to the novice. The program is designed to search through a disk, sector by sector, and find occurrences of a user-specified string of either hexadecimal or ASCII characters.

Practical Applications

Suppose you want to recover a disk file that has gone awry, but can't find all of its bytes. We know that the last byte of each sector is a pointer that tells DOS the number of sectors to jump to find the next sector of the file. Also, we know that the VTOC (Volume Table Of Contents) contains information showing DOS the way to the first sector of a file and that the VTOC is located beginning at sector 361 through sector ___. Who likes to search through an unknown number of sectors with a sector dump utility to find out where the information for "MYPROG" is given?

This program will let you specify the range of sectors to be searched and the string to be found in your choice of hex or ASCII. As an example, let's select ASCII and enter the characters for our filename, and presto – we have the sector and byte to get the information for our file. A word of caution here: DOS apparently leaves the directory entries intact after a file has been deleted. It just revises the VTOC listing to indicate that the file has been deleted (see *Inside Atari DOS* for more information). This will allow you to recover deleted files by changing the VTOC record if DOS has not written any subsequent information over the required sectors.

You can have more than one listing in the VTOC for a filename if you have made revisions and then reused the filename. Also, because DOS fills any unused characters in the first field of a filename with blanks, it is necessary to include an appropriate number of blanks when searching for a filename that uses an extender (for example, MYPROG BAS doesn't use the "dots" found in: MYPROG.BAS). This becomes a small problem once you understand how DOS saves filenames.

Machine language programmers will probably find Disk Detective useful for finding hex strings on boot disks where they might like to make minor modifications for their own use or to look for a particular operating system call in order to see how the designers used these routines in their programs. (*Note:* Disk Detective allows a maximum of 20 characters in its search string.)

Suppose you want to find all calls to the resident disk handler in sectors 1-20. You would first specify this sector range in answer to the prompts, select hex, enter 20-53-E4, then hit RETURN. (For the benefit of those who aren't machine language programmers, the resident disk handler is located at ($ = hex) $E453, and it is called by a JSR command ($20); the 53 comes before the E4 because the CPU expects to read the low byte and then the high byte when reading or executing an object code program from disk or memory.)

Program Explanation

Lines 170-260 are concerned with translating the internal characters returned by the keyboard into their true hexadecimal values and then POKEing them into their respective locations in B$. Variables LN and HN are the low nybble and the high nybble of each byte that is to be POKEd. A is a counter for the low-high nybble; B is a counter for the length of the search string.

Lines 300 through 340 serve the same function

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only for ASCII characters and therefore need no translation.

Lines 400 through 810 set up the call for the machine language portion of the program and examine the results before writing to the screen.

Lines 1000 through 1050 reserve an area in memory for the machine language program and then POKE it into memory.

Lines 2000 through 2140 are the data for the machine language program. This, by the way, uses the resident disk handler to retrieve data from the disk sectors and put the results into A$. It then proceeds to search through A$ to find all occurrences of the search string and then returns to BASIC.

As you can see, this program is useful only after some experience with the machine, and it also assumes that you already have some kind of sector dump/modify utility. You will certainly find many more uses for this program than those discussed here.

Disk Detective

```
10 ? "{CLEAR}":GRAPHICS 2+16:POSITIO
   N 5,3:? #6;"PRESENTING":POSITION
   3,6:? #6;"disk detective"
20 ? #6
30 FOR I=1 TO 2000:NEXT I
40 GRAPHICS 0
90 ? "{BELL}":POKE 752,1:? "{CLEAR}"
   :POSITION 8,8:? "{Loading Machine
   Language}":POSITION 16,11:? "{Routi
   ne}"
100 CLR :DIM A$(128),B$(20),CH$(1):G
    OSUB 1000:REM **LOAD ML**
105 GRAPHICS 0:POKE 752,0:? "Be sure
     to load your search disk":? "
    {BELL}":FOR I=1 TO 2000:NEXT I
110 RPAGE=ADR(B$):? "{CLEAR}":? "BEG
    INNING SECTOR FOR SEARCH";:INPUT
     X:IF X<1 OR X>720 THEN 110
115 B$="{19 ,}"
120 POSITION 2,2:? "ENDING SECTOR FO
    R SEARCH";:INPUT Y:IF Y<X OR Y>7
    20 THEN 120
130 POSITION 2,4:? "INPUT STRING IN
    {HEX} OR {ASCII}?":OPEN #1,4,0,"K:"
135 REM ** IS IT ASCII **
140 GET #1,KB:IF KB=65 THEN 300
145 REM ** OR HEX **
150 IF KB=72 THEN 170
160 ? "{BELL}":CLOSE #1:GOTO 130
170 POSITION 2,4:? "ENTER {HEX} STRING
    :{19 SPACES}":A=0:B=0
180 GET #1,KB:IF KB=155 THEN 400
190 A=A+1:CH$=CHR$(KB):? CH$;:IF A=2
     THEN ? "-";:LN=KB:GOTO 210
200 HN=KB:GOTO 180
210 HN=HN-48:LN=LN-48:IF HN>9 THEN H
    N=HN-7
220 IF LN>9 THEN LN=LN-7
230 HN=HN*16:BYTE=HN+LN:IF BYTE>255
    THEN ? "{BELL}":? "{BELL}":? "{ER
    ROR}":FOR I=1 TO 600:NEXT I:GOTO
    100
240 POKE RPAGE,BYTE:RPAGE=RPAGE+1:A=
    0:B=B+1
250 IF B=21 THEN 400
260 GOTO 180
300 POSITION 2,4:? "ENTER {ASCII} STRI
    NG:{17 SPACES}":B=0
310 GET #1,KB:IF KB=155 THEN 400
320 B=B+1:CH$=CHR$(KB):? CH$;",";:PO
    KE RPAGE,KB:RPAGE=RPAGE+1
330 IF B=20 THEN 400
340 GOTO 310

400 CLOSE #1:C=128-B:POKE 207,B-1
410 BYTE=1776:IF X>Y THEN 600
420 ML=USR(ASSEM,X,ADR(A$),ADR(B$),C
    )
430 IF PEEK(771)=144 THEN 700
440 IF PEEK(771)<>1 THEN 800
450 IF PEEK(BYTE)<>0 THEN 500
495 X=X+1:GOTO 410
500 IF BYTE=1781 THEN 495
503 ? :? "=>SECTOR: ";X;"  BYTE: ";P
    EEK(BYTE)-1
505 IF PEEK(BYTE+1)<>0 THEN BYTE=BYT
    E+1:GOTO 500
510 GOTO 495
600 ? "{BELL}":? :? "{10 SPACES}{HINTS
    HERE}":? "DO YOU WANT TO INSPECT
    OTHER SECTORS? (Y OR N)"
610 OPEN #1,4,0,"K:":GET #1,KB:CLOSE
     #1:CH$=CHR$(KB)
620 IF CH$="Y" THEN 110
630 END
700 ? :? "BAD SECTOR AT ";X
710 GOTO 495
800 ? :? "{ERROR ";PEEK(771);" AT SEC
    TOR ";X
810 GOTO 495
1000 RESTORE 2000
1010 RAMTOP=106:MYPG=PEEK(RAMTOP)-10
1020 ASSEM=MYPG*256:ADDR=ASSEM
1030 READ B:IF B=-1 THEN RETURN
1040 POKE ADDR,B
1050 ADDR=ADDR+1:GOTO 1030
2000 DATA 104,104,141,11,3,104,141,1
     0,3,104
2010 DATA 133,204,141,5,3,104,133,20
     3,141
2020 DATA 4,3,104,133,206,104,133,20
     5,169
2030 DATA 1,141,1,3,169,82,141,2,3,1
     04,104
2040 DATA 133,224,32,83,228,173,3,3,
     201,1
2050 DATA 240,1,96,141,240,6,141,254
     ,6,162,0
2060 DATA 142,241,6,142,242,6,142,24
     3,6,142
2070 DATA 244,6,160,255,200,177,203,
     209,205,240
2080 DATA 25,24,165,203,105,1,133,20
     3,24,173
2090 DATA 254,6,105,1,157,240,6,141,
     254,6,197
2100 DATA 224,208,224,240,38,152,197
     ,207,208,219

2110 DATA 224,5,240,29,232,24,165,20
     3,105,1,133
2120 DATA 203,24,173,254,6,105,1,141
     ,254,6,24
2130 DATA 173,240,6,234,234,141,240,
     6,24,144,184
2140 DATA 169,0,157,240,6,96,-1
```

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64 SOUND TESTER

Ronald V. Picard

The Commodore 64's sound system surpasses the capabilities of all previous microcomputers. Before the 64, a variety of waveforms, attack/decay and sustain/release features were available only on sound synthesizers. Understanding and adjusting to the many different sounds and settings can be perplexing to both beginning and advanced programmers.

"Sound Test" allows you to experiment with these features, then listen to the results and modify the settings. You can explore up to eight octaves as well as the noise generator. At any time the data used may be displayed before exploring other settings.

When you're running the program, a listing of the current values will appear, with a cursor next to the top one. If you want to change the value on that line, you should enter the new value and then press RETURN. If you don't wish to change the value, just press RETURN.

T,S, and P refer to triangle, sawtooth, and pulse waveforms. N stands for the noise generator and Q for quit the program. Anytime you would like to see the data, enter D.

After the last value is entered, a tune will be played with the current ADSR values, after which the program will loop and repeat.

Anyone wishing a cassette copy of the program, send $3, a cassette, and a stamped, self-addressed mailer, to:

Ronald V. Picard
T52 E. Shaw
M.S.U.
E. Lansing, MI 48825

Sound Test

```
5 DIM SO(16,8)
10 HF=54273:LF=54272:AD=54277:SR=54278:W=
    54276:V=54296:HP=54275:LP=54274
15 FORI=1TO8:A(I)=0:NEXT:W$="S"
20 FOR O=1TO8:FOR N=1TO16:READ SO(N,O):NE
    XT:NEXT
25 FOR N=1TO8:READ D(N):NEXT
100 PRINT"{CLEAR}";CHR$(18);"PULSE SETTING
     USED ONLY WITH PULSE WAVE ";CHR$
    (146)
102 PRINT
110 PRINT"WAVEFORM (T,S,P,N) =";W$
112 PRINT"VOLUME (1-15) =";A(1)
114 PRINT"OCTAVE (1-8) =";A(2)
116 PRINT"ATTACK SETTING (0-15) =";A(3)
118 PRINT"DECAY SETTING (0-15) =";A(4)
120 PRINT"SUSTAIN SETTING (0-15) =";A(5)
122 PRINT"RELEASE SETTING (0-15) =";A(6)
124 PRINT"HIGH PULSE SETTING (0-15) =";A(7
    )
126 PRINT"LOW PULSE SETTING (0-255) =";A(8
    )
130 PRINT"{HOME}";"{03 DOWN}";
140 PRINTTAB(33);"?";:GOSUB500:IF Z$="D"TH
    EN 600
150 IF Z$="Q" THEN PRINT"{CLEAR}":END
155 IF Z$<>CHR$(13)THEN W$=Z$
160 FORO=1TO6
170 PRINTTAB(33);"?";:GOSUB500:IF Z$<>CHR$
    (13) THEN A(O)=VAL(Z$)
180 NEXT
190 IF W$<>"P" THEN 230
200 FORO=7TO8
210 PRINTTAB(33);"?";:GOSUB500:IF Z$<>CHR$
    (13) THEN A(O)=VAL(Z$)
220 NEXT
230 POKEV,A(1)
240 POKEAD,16*A(3)+A(4):POKESR,16*A(5)+A(6
    )
250 IF W$="T" THEN POKE W,17
260 IF W$="S" THEN POKE W,33
270 IF W$="P" THEN POKE W,65:POKEHP,A(7):P
    OKELP,A(8)
280 IF W$="N" THEN POKE W,129
300 O=0
310 FOR I=1TO15STEP2:POKEHF,SO(I,A(2)):POK
    ELF,SO(I+1,A(2)):O=O+1:FORN=1TOD(
    O)
311 NEXT
315 POKEHF,0:POKELF,0:NEXT:POKEW,0:POKEAD,
    0:POKESR,0:POKEHP,0:POKELP,0
320 GOTO100
500 Z$=""
510 GETY$:PRINTCHR$(18);" ";CHR$(146);:FOR
    I=1TO25:NEXT:PRINTCHR$(157);" ";
515 PRINTCHR$(157);:FORI=1TO25:NEXT:IFY$="
    "THEN510
520 PRINTY$;
530 IF Y$=CHR$(13) THENIF LEN(Z$)=0 THENZ$
    =CHR$(13)
540 IF Y$=CHR$(13) THEN RETURN
550 Z$=Z$+Y$:GOTO510
600 PRINT"{CLEAR}"
610 PRINT:PRINT"ATTACK/DECAY   = ";16*A(3)
    +A(4)
620 PRINT"SUSTAIN/RELEASE= ";16*A(5)+A(6)
630 PRINT:PRINT:PRINT"HIT ANY KEY TO CONTI
    NUE";
640 GETY$:IFY$=""THEN640
650 GOTO100
1000 DATA 1,155,1,90,1,110,1,155,1,90,1,110
     ,1,155,1,205
1010 DATA 3,54,2,179,2,220,3,54,2,179,2,220
     ,3,54,3,155
1020 DATA 6,108,5,103,5,185,6,108,5,103,5,1
     85,6,108,7,53
1030 DATA 12,216,10,205,11,114,12,216,10,20
     5,11,114,12,216,14,107
1040 DATA 25,177,21,154,22,227,25,177,21,15
     4,22,227,25,177,28,214
1050 DATA 51,97,43,52,45,198,51,97,43,52,45
     ,198,51,97,57,172
1060 DATA 102,194,86,105,91,140,102,194,86,
     105,91,140,102,194,115,88
1070 DATA 205,133,172,210,183,25,205,133,17
     2,210,183,25,205,133,230,176
1080 DATA 500,250,250,250,250,250,250,1000
```

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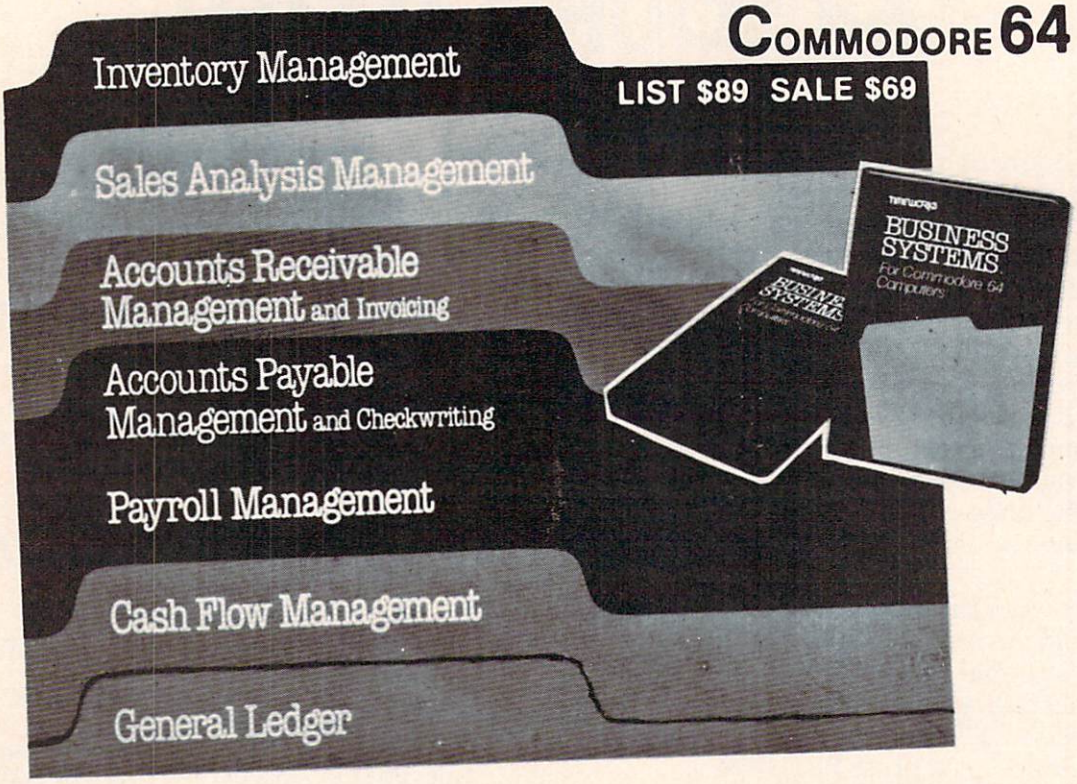

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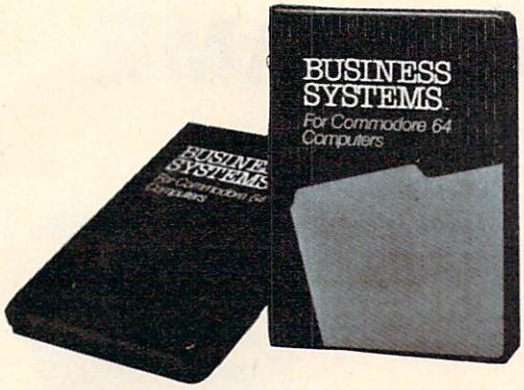

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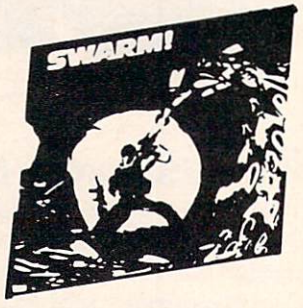

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How To Improve The TV Quality Of The Commodore 64

Jim Butterfield, Associate Editor

If you own a 1701 Video Monitor, you may not be getting maximum video quality. Here's an alternative hookup that produces a remarkable picture. Even if you don't use a 1701, you can still use some of these ideas to improve your computer's picture quality on a TV or monitor.

The Commodore 1701 Video Monitor is an attractive 13-inch color monitor with good color definition and good sound. But most Commodore 64 users miss a bet: they hook it up via the front connections.

There seems to be a rumor that you can't use the connections at the back unless you have an 8-pin video connector. Not true – you can get a magnificent picture from the traditional 5-pin interface.

Inside A Monitor

There are two parts to a video signal: the brightness and the color. Most monitors mix them together to produce a "composite" video signal. Inside a monitor – or television set – the two signals must be split apart once again before they can be used.

The color (or *chrominance*) signal is carefully designed so that it can be mixed in with the brightness (or *luminance*) and later separated. The system isn't perfect, however, and there's always a trace of the color signal left in the screen brightness.

Traces of the chrominance signal left in the brightness can cause viewing trouble. Depending on the foreground and background colors, a finely checkered pattern can appear on the screen. To make matters worse, this pattern interferes with the normal pixel resolution of the screen, and every second character on the screen will look smeared.

For some colors, this isn't a problem. Other color combinations look bad. But the whole problem can be solved by not mixing chrominance and luminance; instead, deliver them on separate wires to the monitor.

By the way, there's another method used to deliver signals to video monitors. It's called RGB, for Red/Green/Blue; it uses three signal wires, one for each color. However, this method is not available for use with the Commodore 64.

Hooking It Up

There are two different video signals available on the 5-pin DIN connector on the 64. The signal on pin 4 is called *Video Out*: it's a composite video signal containing both luminance and chrominance. On pin 1, we'll find the luminance signal: a sharp, black-and-white signal with no color component. If you connect pin 1 to the 1701's luminance connection, and pin 4 to the nearby chrominance connection (they are both on the back of the monitor), you'll get a picture of marvelous quality.

I'm amazed to find that the necessary cable doesn't come in the box with the monitor. The

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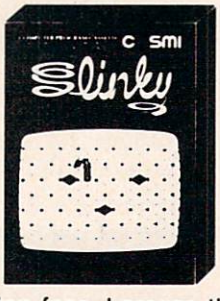

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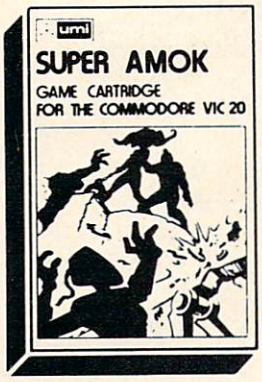

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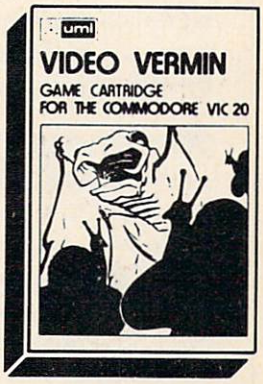

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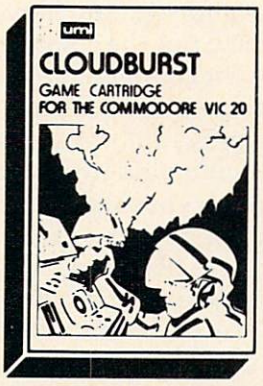

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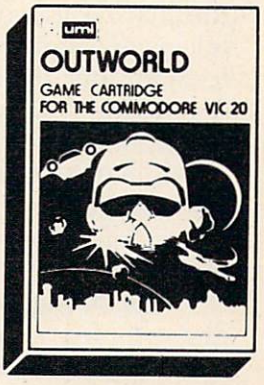

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connector that comes with the monitor is wired for the front connection. This is fine for both the VIC and the 64, but the 64 can do far better on the rear connection. At the present time, the cable isn't provided; you'll have to wire one up or buy one.

If you'd rather not wire your own cables, you can buy a general-purpose "octopus" connector that brings out all five pins to differently colored plugs. The color codes don't seem to be universally consistent, but on the ones I tried, the most common arrangement seemed to be: red for luminance, white for chrominance (video out), and black for audio. Remember – throw the little switch at the back of the monitor to energize the back connections.

How is it that we can use a composite video signal as chrominance? Because the chrominance connection throws out any luminance that may be mixed into the signal.

Sharpness

Let's talk for a moment about why the picture is so sharp on a properly hooked-up monitor. It has to do with two aspects of television standards.

First, the color signal is "modulated," or coded, using a high frequency signal at slightly over 3.58 megacycles per second. That's a TV standard: it was designed long ago so that we could decode the color signal and separate it from the brightness. If we didn't take out the color signal (and we can never remove it completely), we would get a pattern of fine dots on the screen. These dots would not be too noticeable on a conventional television picture, but would interfere with our perception of computer characters.

Second, television color has been carefully designed to be less sharp than the black-and-white part of the picture. It turns out we can't detect color sharpness as accurately as black-and-white; so the television engineers deliberately take out the sharp color edges to allow them to design the television signal more efficiently. The technical term for this, by the way, is *lower bandwidth.*

So the sharpness is always in the black-and-white, or luminance, part of the signal. And the chrominance signal is not only less sharp, but also contains an extra frequency that will degrade the picture. No wonder we would prefer not to mix them.

The strange interrelationship of sharpness and color leads to another odd thing. If you ever draw high-resolution pictures on the 64, you are advised to make lines at least two pixels wide. Why? Because extremely thin, sharp lines get partly mixed into the color signal, and you'll get a slight but annoying "color smear" on these lines. But it won't happen on a rear-connected 1701 monitor.

If You Don't Have A 1701...

Even if you don't have the 1701 monitor, you can make use of the information on how the video signal works.

If you have a conventional color monitor, or just a color TV set, you can try for a sharper picture. The objective here is to put more luminance into the video signal. We do this by making a connection between pin 1 and pin 4 on the video connector of the 64. If you have a monitor, you can connect the two pins within the cable. If you have a TV set, you must make up a video plug with the two pins strapped together; even though the signal doesn't go out through this connector, the balance between luminance and chrominance will change. In either case, you'll need to readjust the color controls to get a satisfactory picture; and you might not even like the results. If you'd rather not do your own cabling or soldering, have your local computer or TV service store do the job for you.

You can also make a significant improvement on a black-and-white monitor, which you might use for such things as word processing or financial calculations where color doesn't matter. Now that you know about pin 1, which contains the luminance signal only, you can use it for a crisp black-and-white picture. ©

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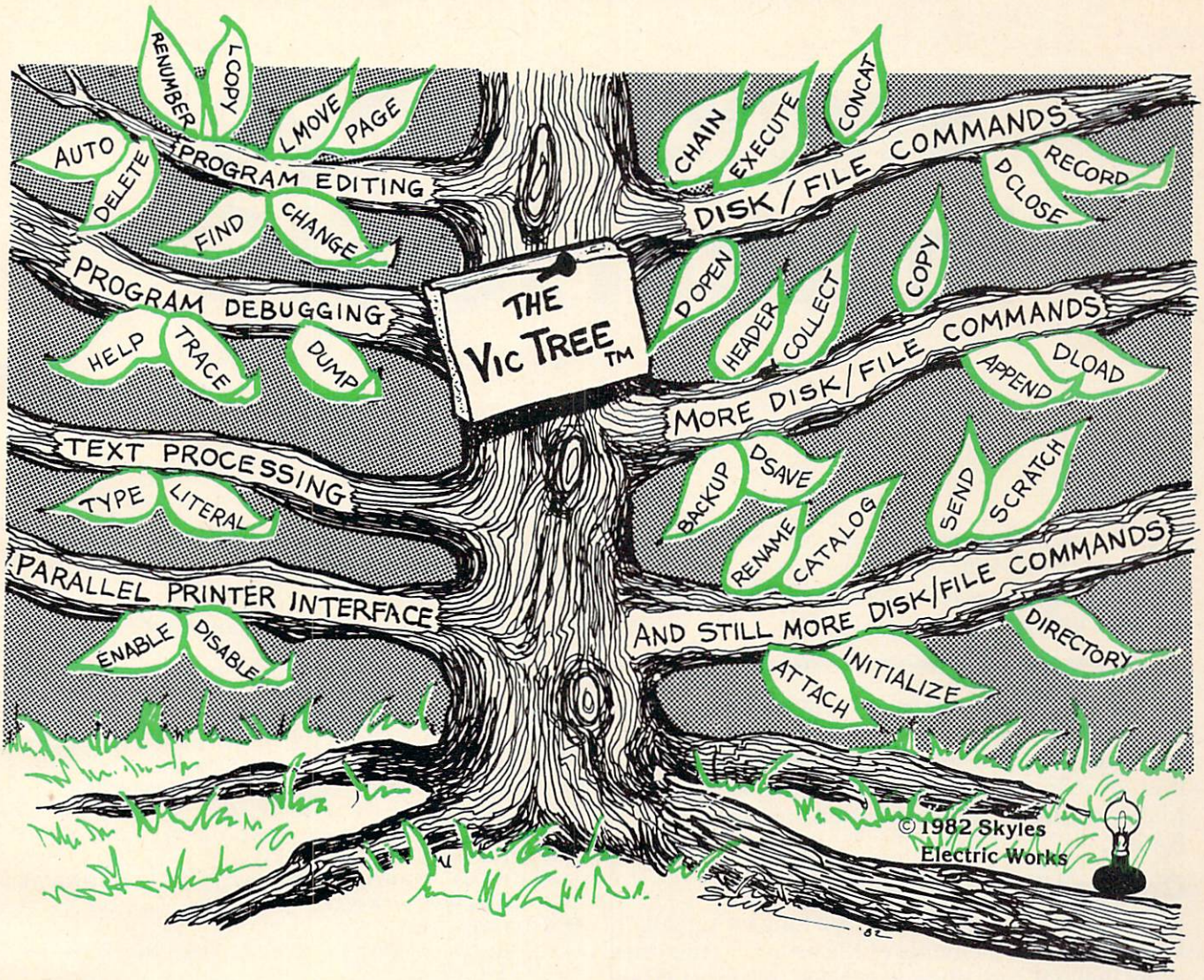

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String Arrays In Atari BASIC

Stephen Levy

This tutorial demonstrates an easy way to create string arrays in Atari BASIC. The author provides example programs and also includes a few handy ideas you can use with other programs.

If you want string arrays on your Atari computer, you'll just have to purchase Atari's Microsoft BASIC disk. A common belief, but not entirely true. Although string arrays are more easily handled with Microsoft BASIC, they can be created with Atari BASIC.

Creating The Array

What we actually create here is a long string which will hold all the elements of the array. So that the array will not contain any garbage, we must clean it out before using it.

There are two ways to accomplish this. You could simply DIMension a string to 1000 and then fill it with "*" using a FOR-NEXT loop.

```
90 DIM B$(1000)
100 FOR A=1 TO 1000
110 B$(A,A)="*"
120 NEXT A
130 PRINT B$
```

Here's another way to do the same thing a little differently and much more efficiently:

```
100 DIM B$(1000)
110 B$="*":B$(1000)="*":B$(2)=B$
120 PRINT B$
```

A lot faster, isn't it? You can use this method whenever you want to fill a large string with the same character. This is exactly what we must do to begin creating our string array. But with this next program, we need to fill the string with blanks.

Type in and RUN the following program. When you are asked for names, enter the names of ten friends, pressing RETURN after each. As written the program will allow only names with up to ten letters.

```
100 DIM ARRAY$(100),ELEMENT$(10):PRI
    NT CHR$(125)
110 ARRAY$=" ":ARRAY$(100)=" ":ARRAY
    $(2)=ARRAY$
120 FOR A=1 TO 10
130 PRINT "NAME FOR ARRAY$(";A;") PL
    EASE";:INPUT ELEMENT$
140 ARRAY$(A*10-9,A*10)=ELEMENT$
150 ELEMENT$=" ":NEXT A
160 PRINT
200 FOR A=1 TO 10
210 PRINT "ARRAY$(";A;") IS ";ARRAY$
    (A*10-9,A*10):NEXT A
300 TRAP 340
310 PRINT :PRINT "GIVE THE NUMBER (1
     TO 10)"
320 PRINT "OF THE ARRAY YOU WISH TO
    SEE";:INPUT A
330 PRINT ARRAY$(A*10-9,A*10):GOTO 3
    10
340 PRINT CHR$(253):GOTO 300
```

Notice that the program sets up an array with ten elements and allows you to pick from any of the ten.

How It Works

Line 100 DIMensions the array and clears the screen. Line 110 fills the array with blanks and line 120 establishes a loop so you can enter ten names. Line 130 gets your input.

Line 140 is the heart of the creation of the array. Within the parentheses the computer is told what *part* of the string should hold your input string ELEMENT$. The first time through, A=1; therefore, ARRAY$(A*10−9,A*10) will mean ARRAY$(1,10) or the first ten positions in the string. When A = 2, we place ELEMENT$ in the eleventh to twentieth positions (2*10−9 = 11 and 2*10=20). This continues until the string is full.

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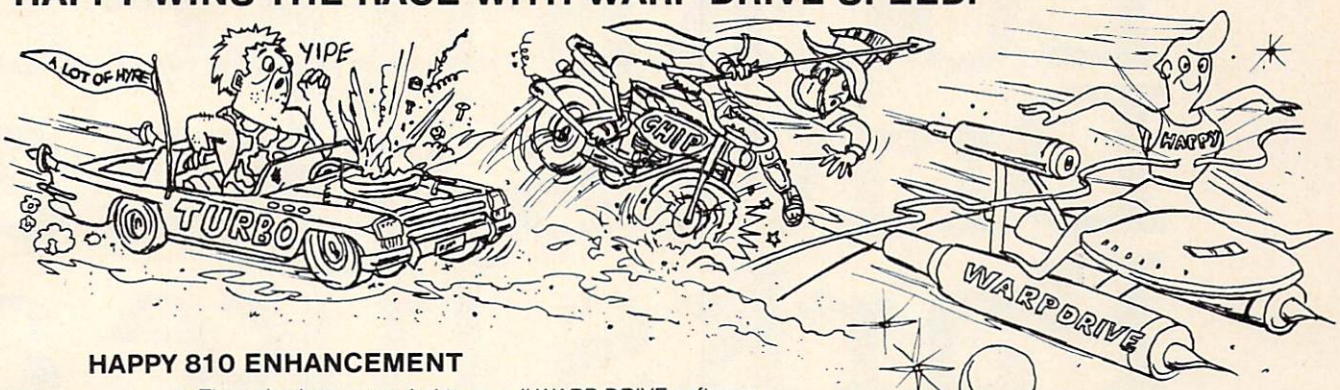

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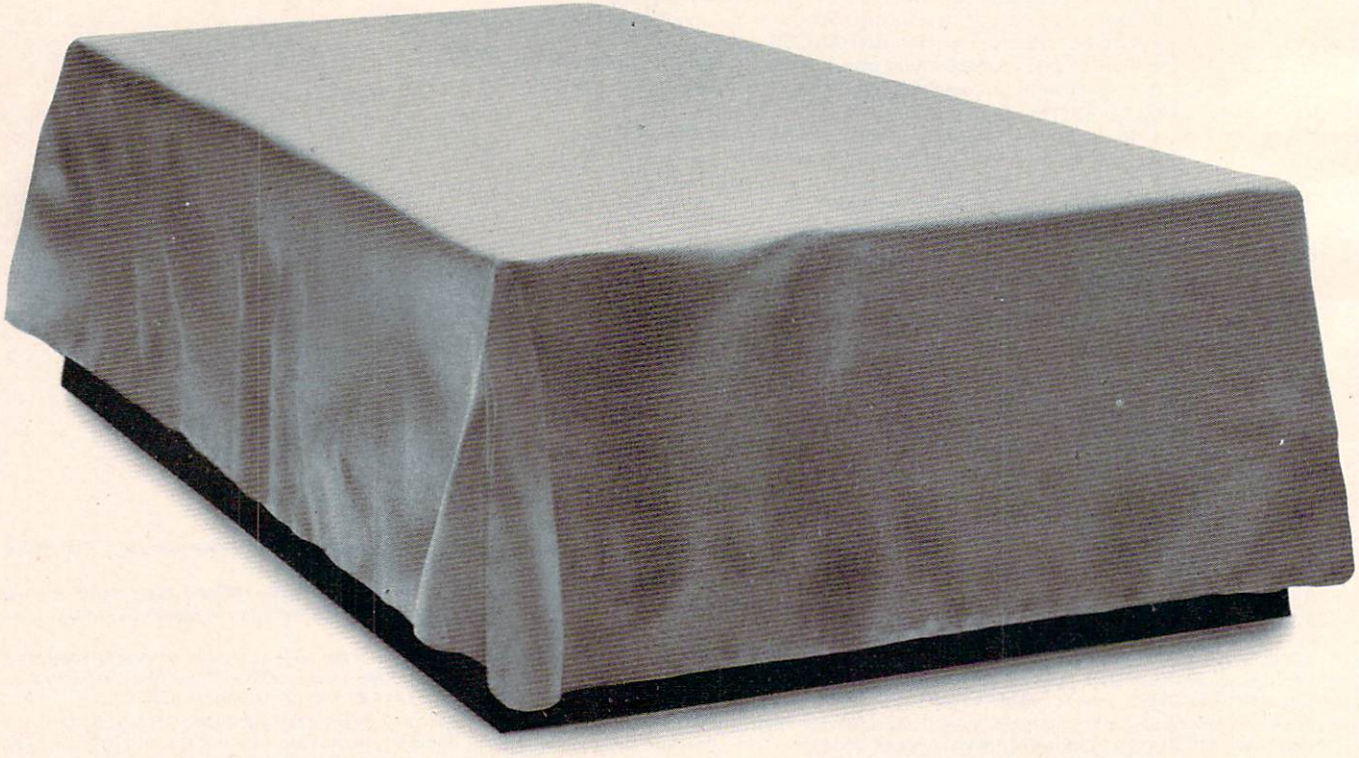

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Line 210 does the same thing, but in reverse order: it reads ARRAY$ and prints the proper part to the screen. Line 330 does the same thing, but only for the part of the string you request.

Try this: RUN the program and enter any ten names. Then press BREAK. Type PRINT ARRAY$ without a line number, press RETURN, and see what happens.

Now RUN the program again, but simply press RETURN without entering anything for the names. Although there appears to be nothing in ARRAY$, it is actually filled with blanks. Type PRINT ARRAY$ again and see what happens.

There are also a few other techniques here which may be helpful. Lines 300 and 340 prevent the program from crashing when an incorrect INPUT is entered. TRAP 340 sends the program to line 340 instead of printing ERROR 8 LINE 320 when you enter a Q (or whatever) instead of a required number between one and ten. PRINT CHR$(253) rings the buzzer, just as PRINT CHR$(125) in line 100 clears the screen.

With these techniques, you now should be able to use string arrays in your own programs. ©

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Apple Sounds — From Beeps To Music

Part 2

Blaine Mathieu

In the conclusion of this two-part series, the author combines the ideas and programs from Part 1 and presents the "Apple Music Writer." An effective tool for composing or reproducing songs, this utility is also easy to use because of its great variety of commands. There's a thorough discussion of how to use each command.

"Apple Music Writer" is a program which will allow any Apple owner to easily reproduce his or her favorite songs. When you run the program, the first thing you'll notice is the title, and then you'll hear part of a tune that you may recognize. After the tune stops, you will be prompted by the word COMMAND? and a flashing cursor. At the top of the screen you should see a list of the possible commands and corresponding letters. On the right side of your screen you should see a list of note names with corresponding values.

It's important that you understand and know how to use the commands, so let's review them in some detail, in the order that they appear on the screen. These commands are usable only from the COMMAND? mode; you must also RETURN after each command. You may want to experiment with them as we go along.

The Commands

A = ADDNOTE. This command will let you begin your music file (song) and keep adding to it. Every time you press A (and RETURN) you will be prompted to enter the note, a comma, and the duration. For example:

```
NOTE#1
NOTE,DURATION 128,200
```

The maximum note value is 255 (actually 0 = 256). The same is true for the duration value. After you've entered your values, you will hear what the new note will sound like in the song.

E = EDIT. If you've made a mistake, you can fix it by typing E (and, as always, RETURN). You will then be asked the number of the note you want to edit. If the note you want to edit is not part of the music file, you will be reprompted for the note number. If you entered a valid note number, you will be given the old values for that note and prompted for new values. The same rules apply for entering data as in ADDNOTE. Let's say you want to edit note number one and replace the old values with new ones of 64 and 200:

```
COMMAND? E
EDIT NOTE#1
NOTE#1 OLD: NOTE = 128 DUR = 200
NOTE,DURATION: 64,200
```

P = PLAY. Typing P will put you into Play mode. This will play your song and print it to the screen at the same time. Because it is both listing and playing your music file, the playing will not be at the same speed as in your program. It will be slower and more pronounced. After entering P you will be prompted for the starting and ending note to Play/list. If you just press RETURN instead of entering values, the whole song will be played (defaults will be set; D is the default).

S = SAVE. This command will SAVE your music file to disk. First you will be prompted for a filename, which will be the name used when the file is SAVEd. Then you'll be prompted for the number of the first and last note of your file that you want saved to disk. The next question is FOR FUTURE ADDITION? A little explanation is in order here. There are two types of files which can be produced with this command. If you answer Y to the above question, a file will be created that can be reloaded into Apple Music Writer at any time. You should use this option if you feel you may want to add more notes or edit your song at a later date. If you enter N, a file will be created that you can easily turn into a BASIC program that will play your song when run.

If you answer the FUTURE ADDITION? question with an N, you will be asked for the starting line number of your soon-to-be-created BASIC

music program. Then you will be asked if you want a FULL LOADER PROGRAM? If you answer Y, the BASIC program created will include the necessary information so that when your new program is RUN, the machine language "Note Producer" (see Part 1) routine will be POKEd in. If you answer N, the routine will not be included. You would answer N if the program you wanted to add the music to already included some sort of "Note" routine (the routine found in Program 5 of Part 1 of "Apple Sounds – From Beeps To Music").

Finally, you will be prompted to check for errors. If everything is all right, enter Y and the file will be SAVEd. If you enter N, you have to repeat the entire SAVE process. Here is an example of what the average SAVE command might encompass:

```
COMMAND? S
(Screen is cleared)
FILENAME? SONG.1
STARTING NOTE NUMBER: 2
ENDING NOTE NUMBER: 10
FOR FUTURE ADDITION? N
STARTING LINENUMBER: 100
FULL LOADER PROGRAM? Y
IS EVERYTHING OK? Y
```

Your music file would now be SAVEd under the filename SONG.1. The file would consist of notes two through ten, and the generated program would start at line 100. The generated program would include the machine language "Note" routine.

L = LOAD. If you answered Y to the FOR FUTURE ADDITION? question back in the SAVE command, you can LOAD an old music file back into the computer. The catch is that you will lose any data that you entered into the computer beforehand. If you don't want to lose your data, then answer N to the question about losing your data. Just enter the appropriate filename, and you can manipulate or add to your data once again.

N = NORPLAY. As mentioned earlier, when you P (Play/list) your song, it will play at a slower speed because it has to list the note values at the same time. To alleviate that problem, you can use the NORmal PLAY command. This will play your song in the same tempo as it will normally be played by your generated program. Just enter the proper values (or defaults will be used) and listen.

D = DELETE. Upon entering D from the COMMAND? mode, you will be asked which note or notes you want to delete. If you hit RETURN after the first question without typing anything else, the default will be used and the last note in the music file will be deleted. If you enter a value for the first question, you will be asked the number of the last note up to which you want to delete. The appropriate notes will then be deleted, and you're back to the COMMAND? mode.

I = INSERT. This command is the exact opposite of the Delete command. Simply answer the few setup questions and enter the data. Note: You cannot leave the Insert mode until you have entered all the data you specified you were going to enter.

R = RESTART. This command lets you start over with a clean slate beginning with note number one.

C = CATALOG will return a fairly standard DOS catalog.

Q = QUIT. Use this command to exit the program cleanly. You will lose all your data that hasn't been SAVEd to disk. If you quit by accident, a GOTO 200 will usually let you reenter the program with no data lost.

. = DOS. What this means is that typing a period followed by any normal DOS command will execute that command. A common use for this might be:

```
COMMAND? .DELETE FILENAME
```

Caution: Certain DOS commands will cause the Apple Music Writer to cease functioning, thus causing a loss of data. Take care.

H = HARD. If you have a printer connected to your Apple, you can get a simple hard copy of your music file by entering H from the COMMAND? mode. Note: You may have to edit lines 1210 and 1220 to accommodate different printers.

Hints For Easier Use

Saving. One good idea is to save two copies of your music file to the disk. One copy should be done in the FUTURE ADDITION? mode so you can edit or add to it at a later date. If you wish, the other copy can be done in the *create program*, or FUTURE ADDITION? N mode. Always remember to use a different filename.

Tempo. When you enter your durations, remember that if your quarter note has a value of 50, your half note will have a value of 100 and so on. You should set a plan of what duration you want a certain type of note to be and work from there. Rests are done with a note value of one.

Limits. The number of notes you can have in one song is limited. For our purposes the number is 500, but by changing the value of L in line 120, this limit can be raised.

Notes. The note listings on the side of the screen are especially helpful if you are transposing sheet music to disk. The numbers listed are for the middle octave. For the higher octave, divide the number by two; and for the lower octave, multiply the number by two. For example, the note F could be represented by the numbers 36, 72, and 144. You can also make a separate list of all the notes and their numbers. Remember, F# is the same as G-flat and so on. Also, once again, the number zero is equivalent to the number 256.

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Exec. In order to use a program that you made in the FUTURE ADDITION? N mode, you must EXEC it. EXEC is a DOS command that prints a sequential text file to the screen as if it were typed from the keyboard. In this way, you can EXEC your file and RUN it as a BASIC program. Later on, you can SAVE it. Another feature is that you can LOAD an old BASIC program (game or whatever) and EXEC your sound routine into it. For this to work properly, however, you must have specified the starting line number during the save of your music file such that the line numbers of the music routine do not conflict with those of the program to which the routine is being added.

Insert. If you have a large amount of repetitive data to type in, one trick is to enter the last note of that data, then Insert the rest. This saves you from repeatedly typing A from COMMAND? mode. (This is useful only if you know beforehand exactly what data you want to enter.)

Keys. There are a number of key codes that you can use with Apple Music Writer. If at any time the screen is getting too cluttered, an ESC-SHIFT-P should do the trick. You can stop a Catalog or a Play/list at any moment with a CTRL-S, and restart it with the touch of any key. Finally, in this program, CTRL-C RETURN can be a useful but sometimes dangerous command. I would recommend using CTRL-C only if you are caught in a never-ending loop or as a last resort. If for any reason you find yourself out of Apple Music Writer, you can usually reenter the program, without losing any data, by typing GOTO 200.

Experiment. No matter how long or well written a manual, nothing can take the place of hands-on experience with a program. Before you try any big projects, be sure you know what's going to happen at all times no matter what you enter during Apple Music Writer. Overall the program is very forgiving. One last thing – the best songs on the Apple seem to be songs with few or no rests. Try using longer notes instead of rests.

If you'd rather not type in the program, send $3, a stamped, self-addressed disk mailer, and an initialized blank disk (Apple DOS 3.3 compatible) to:

Blaine Mathieu
Box 2572
Peace River, Alberta
Canada, T0H 2X0

Apple Music Writer

```
10  REM     APPLE MUSIC WRITER
20  REM  INITIALIZATION     ,
30  TEXT : HOME : VTAB 1: PRINT "A=ADDN
    OTE E=EDIT     P=PLAY     S=SAVE
    L=LOAD     N=NORPLAY D=DELETE  I=IN
    SERT  R=RESTART C=CATALOG Q=QUIT .
    =DOS H=HARD": PRINT "-------------
    ---------------------------": POKE
    34,5
40  VTAB 6: HTAB 34: PRINT "G =64": PRINT
     TAB( 34)"F#=68": PRINT  TAB( 34)"
    F =72": PRINT  TAB( 34)"E =76": PRINT
     TAB( 34)"D#=81": PRINT  TAB( 34)"
    D =86": PRINT  TAB( 34)"C#=91"
50  PRINT  TAB( 34)"C =96": PRINT  TAB(
    34)"B =102": PRINT  TAB( 34)"A#=10
    8": PRINT  TAB( 34)"A =115": PRINT
     TAB( 34)"G#=121": PRINT  TAB( 34)
    "G =128": PRINT  TAB( 34)"/2 FOR":
     PRINT  TAB( 34)"HIGHER": PRINT  TAB(
    34)"*2 FOR": PRINT  TAB( 34)"LOWER
    ": POKE 33,32
60  FOR LOC = 770 TO 790: READ BYTE: POKE
    LOC,BYTE: NEXT
70  DATA  173,48,192,136,208,5,206,1,3,
    240,9,202,208,245,174,0,3,76,2,3,96
80  HOME : INVERSE : VTAB 10: HTAB 9: PRINT
    "APPLE MUSIC WRITER"
90  FOR R = 1 TO 26: READ P,D: POKE 768
    ,P: POKE 769,D: CALL 770: NEXT R
100  DATA 172,75,162,75,152,75,144,75,1
    08,100,1,30,144,75,108,100,1,30,14
    4,75,108,255,1,10,108,75,96,75,91,
    75,86,75,108,75,96,75,86,100
110  DATA 1,10,115,75,96,100,1,10,108,1
    50,144,150,216,200,
120  HOME :L = 500: DIM N(L),D(L),N$(L)
    ,D$(L),NN(L),ND(L)
130  REM  MAIN ROUTINES START
140  VTAB 5: GOTO 190
150 I = I + 1
160  PRINT : INVERSE : PRINT "NOTE#"I:
    NORMAL
165  INPUT "NOTE,DURATION ";N$(I),D$(I)
    : IF N$ =  CHR$ (8) OR D$ =  CHR$
    (8) THEN N$(I) = N$(I - 1):D$(I) =
    D$(I - 1)
170 N(I) =  VAL (N$(I)):D(I) =  VAL (D$
    (I)): IF N(I) > 255 OR N(I) < 0 OR
    D(I) > 255 OR D(I) < 0 THEN 160
180  POKE 768,N(I): POKE 769,D(I): CALL
    770
190  ONERR  GOTO 370
200  PRINT : INPUT "COMMAND? ";A$
210  IF A$ = "A" AND I = L THEN  PRINT
    "YOU ARE AT YOUR LIMIT!!!": GOTO 2
    00
220  IF A$ = "A" THEN 150
230  IF I <  = 0 AND (A$ = "E" OR A$ =
    "P" OR A$ = "H" OR A$ = "N" OR A$ =
    "I" OR A$ = "S") THEN  PRINT "SORR
    Y, NO NOTES":I = 0: GOTO 190
240  IF A$ = "Q" THEN 450
250  IF A$ = "E" THEN 470
260  IF A$ = "P" THEN 390
270  IF A$ = "S" THEN 530
280  IF A$ = "D" THEN 1410
290  IF A$ = "L" THEN 990
300  IF A$ = "R" THEN I = 0
310  IF A$ = "C" THEN  PRINT  CHR$ (4)"
    CATALOG"
320  IF  LEFT$ (A$,1) = "." THEN 1120
330  IF A$ = "H" THEN 1160
340  IF A$ = "N" THEN 1250
350  IF A$ = "I" THEN 1310
360  GOTO 190
370  PRINT "ERROR#" PEEK (222): GOTO 190
380  REM  PLAY ROUTINE
```

```
390  PRINT : INPUT "STARTING NOTE (D=1)
     : ";SN$:SN =  VAL (SN$): IF SN$ =
     "" THEN SN = 1
400  PRINT : INPUT "ENDING NOTE (D=LAST
     ): ";EN$:EN =  VAL (EN$): IF EN$ =
     "" THEN EN = I
410  IF SN < 1 OR SN > I OR EN < 1 OR E
     N > I THEN 390
420  PRINT : INVERSE : PRINT "START OF
     SONG": PRINT : NORMAL : FOR X = SN
      TO EN: POKE 768,N(X): POKE 769,D(
     X): PRINT "NOTE#";X;: HTAB 10: PRINT
     "NOTE=";N(X);: HTAB 19: PRINT "DUR
     ATION=";D(X): CALL 770: NEXT X
430  INVERSE : PRINT : PRINT "END OF SO
     NG": NORMAL
440  GOTO 190
450  TEXT : HOME : PRINT "GOODBYE": END

460  REM  EDIT ROUTINE
470  INPUT "EDIT NOTE# ";NN: IF NN > I OR
     NN < 1 THEN 470
480  PRINT : INVERSE : PRINT "NOTE#"NN;
     : NORMAL : PRINT " OLD: NOTE="N(NN
     );" DUR="D(NN)"
490  INPUT "NOTE,DURATION: ";N$(NN),D$(
     NN):N(NN) =  VAL (N$(NN)):D(NN) =
      VAL (D$(NN)): IF N(NN) > 255 OR N
     (NN) < 0 OR D(NN) > 255 OR D(NN) <
     0 THEN 480
500  POKE 768,N(NN): POKE 769,D(NN): CALL
     770
510  GOTO 190
520  REM  SAVE ROUTINE

530  ONERR  GOTO 860
540  HOME : INPUT "FILENAME? ";FI$: IF
     FI$ = "" THEN 540
550  PRINT : INPUT "STARTING NOTE NUMBE
     R: ";SN: IF SN < 1 OR SN > I THEN
     550
560  PRINT : INPUT "ENDING NOTE NUMBER:
      ";EN: IF EN > I OR EN < 1 THEN 56
     0
570  PRINT : INPUT "FOR FUTURE ADDITION
     ? ";A$: IF A$ <  > "N" AND A$ <  >
     "Y" THEN 570
580  IF A$ = "Y" THEN  POKE 216,0:F2 =
     1: GOTO 640
590 F2 = 0
600  PRINT : INPUT "STARTING LINENUMBER
     : ";SL: IF SL > 63900 OR SL < 0 THEN
     600
610  PRINT : INPUT "FULL LOADER PROGRAM
     ? ";A$:A$ =  LEFT$ (A$,1): IF A$ <
      > "Y" AND A$ <  > "N" THEN 610
620  IF A$ = "Y" THEN FL = 1
630  IF A$ = "N" THEN FL = 0
640  PRINT : INPUT "IS EVERYTHING OK? "
     ;A$: IF  LEFT$ (A$,1) = "Y" AND F2
      = 1 THEN 880
650  IF  LEFT$ (A$,1) = "Y" AND F2 <  >
     1 THEN 670
660  GOTO 190
670 D$ =  CHR$ (4): PRINT D$"OPEN"FI$
680  PRINT D$"DELETE"FI$
690  PRINT D$"OPEN"FI$
700  PRINT D$"WRITE"FI$
710  IF FL <  > 1 THEN  GOTO 740
720  PRINT SL;"FORLOC=770TO790:READBYTE
     :POKELOC,BYTE:NEXT":SL = SL + 2
730  PRINT SL;"DATA173,48,192,136,208,5
     ,206,1,3,240,9,202,208,245,174,0,3
     ,76,2,3,96":SL = SL + 2
740  PRINT SL;"FORR=1TO";EN - SN + 1;":
     READP,D:POKE768,P:POKE769,D:CALL77
     0:NEXTR":SL = SL + 2
750  FOR Z = SN TO EN
760 N = N + 1: IF N = 20 THEN N = 1
770  IF N <  > 1 THEN 810
780  PRINT
790  PRINT SL;"DATA";
800 SL = SL + 2
810  PRINT N(Z);",";D(Z);: IF N <  > 19
      THEN  PRINT ",";
820  NEXT Z
830  PRINT
840  PRINT D$"CLOSE"
850  GOTO 190
860  PRINT : PRINT  CHR$ (7);"ERROR#"; PEEK
     (222): PRINT D$"CLOSE": GOTO 190
870  REM  2ND SAVE ROUTINE
880  ONERR  GOTO 980
890 D$ =  CHR$ (4): PRINT D$"OPEN"FI$
900  PRINT D$"DELETE"FI$
910  PRINT D$"OPEN"FI$
920  PRINT D$"WRITE"FI$
930  FOR S = SN TO EN
940  PRINT N(S): PRINT D(S)
950  NEXT S
960  PRINT D$"CLOSE"
970  GOTO 190
980  REM  LOAD ROUTINE
990  ONERR  GOTO 1090
1000  INPUT "YOU WILL LOSE YOUR DATA, O
     K? ";OK$:OK$ =  LEFT$ (OK$,1): IF
     OK$ <  > "Y" AND OK$ <  > "N" THEN
     1000
1010  IF OK$ = "N" THEN  POKE 216,0: GOTO
     190
1020  PRINT : INPUT "FILENAME: ";FI$: IF
     FI$ = "" THEN 1020
1030 D$ =  CHR$ (4): PRINT D$"VERIFY"FI
     $: PRINT D$"OPEN"FI$
1040  PRINT D$"READ"FI$
1050  FOR Z = 1 TO L
1060  INPUT N(Z): INPUT D(Z)
1070  IF N(Z) <  = 255 AND D(Z) <  = 25
     5 THEN  NEXT Z: POKE 216,0: PRINT
     D$"CLOSE":I = Z - 1: GOTO 190
1080  PRINT : PRINT "INCOMPATIBLE FILE!
     !!": PRINT D$"CLOSE": POKE 216,0: GOTO
     190
1090  PRINT D$"CLOSE": IF  PEEK (222) =
     5 THEN  POKE 216,0:I = Z - 1: GOTO
     190
1100  PRINT : PRINT "ERROR#"; PEEK (222
     ): PRINT D$"CLOSE": GOTO 190
1110  REM  HANDLE DOS COMMANDS
1120  ONERR  GOTO 1140
1130 DC$ =  RIGHT$ (A$, LEN (A$) - 1): PRINT
      CHR$ (4);DC$: POKE 216,0: GOTO 19
     0
1140  PRINT "ERROR#" PEEK (222): PRINT
      CHR$ (4)"CLOSE": POKE 216,0: GOTO
     190
1150  REM  PRINTER ROUTINE

1160  PRINT : INPUT "PRINTER READY? ";A
     $: IF A$ <  > "Y" AND A$ <  > "N" THEN
     1160
1170  IF A$ = "N" THEN 200
1180  PRINT : INPUT "STARTING NOTE TO B
     E PRINTED --  DEFAULT=1: ";ST$: IF
```

```
     ST$ = "" THEN ST$ = "1"
1190  PRINT : INPUT "ENDING NOTE TO BE
     PRINTED --    DEFAULT=ALL: ";EN$: IF
     EN$ = "" THEN EN$ =  STR$ (I)
1200 ST =  VAL (ST$):EN =  VAL (EN$): IF
     ST < 1 OR ST > I OR EN < 1 OR EN >
     I OR EN < ST THEN 1180
1210  PRINT : INPUT "NAME OF SONG: ";FI
     $: IF FI$ = "" THEN 1210
1220  PR# 1: PRINT : PRINT FI$: PRINT :
      FOR X = ST TO EN: PRINT "NOTE#";X
     ;: HTAB 10: PRINT "NOTE=";N(X);: HTAB
     19: PRINT "DURATION=";D(X): NEXT X

1230  PRINT : PRINT "END OF SONG": PR#
     0: GOTO 190
1240  REM  NORMAL PLAY ROUTINE
1250  PRINT : INPUT "STARTING NOTE (D=1
     ): ";SN$:SN =  VAL (SN$): IF SN$ =
     "" THEN SN = 1
1260  PRINT : INPUT "ENDING NOTE (D=LAS
     T): ";EN$:EN =  VAL (EN$): IF EN$ =
     "" THEN EN = I
1270  IF SN < 1 OR SN > I OR EN < 1 OR
     EN > I THEN 1250
1280  FOR Z = SN TO EN: POKE 768,N(Z): POKE
     769,D(Z): CALL 770: NEXT Z
1290  GOTO 190
1300  REM  INSERT ROUTINE
1310  POKE 216,0: PRINT : INPUT "INSERT
      BEFORE WHAT NOTE? ";IB: IF IB < 1
      OR IB > I THEN 1310
1320  PRINT : INPUT "HOW MANY NOTES TO
     INSERT? ";HM: IF HM > L - I OR HM <
     1 THEN 1320
1330  FOR Z = IB TO IB + HM - 1
1340  PRINT : INVERSE : PRINT "NOTE#"Z:
      NORMAL : INPUT "NOTE,DURATION: ";
     NN(Z),ND(Z): IF NN(Z) < 0 OR NN(Z)
      > 255 OR ND(Z) < 0 OR ND(Z) > 255
      THEN 1340
1350  POKE 768,NN(Z): POKE 769,ND(Z): CALL
     770
1360  NEXT Z
1370  FOR Z = I TO IB STEP  - 1:N(Z + H
     M) = N(Z):D(Z + HM) = D(Z): NEXT Z

1380  FOR Z = IB TO IB + HM - 1:N(Z) =
     NN(Z):D(Z) = ND(Z): NEXT Z
1390 I = I + HM
1400  GOTO 190
1410  REM  DELETE ROUTINE
1420  PRINT : INPUT "DELETE FROM NOTE (
     D=LAST): ";DF$: IF DF$ = "" THEN I
      = I - 1: IF I =  - 1 THEN I = 0: GOTO
     190
1430  IF DF$ = "" THEN 190
1440  PRINT : INPUT "TO NOTE: ";DT$:DF =
      VAL (DF$):DT =  VAL (DT$): IF DT <
     1 OR DT > I OR DF < 1 OR DF > I OR
     DF > DT THEN 1420
1450  FOR Z = DT + 1 TO I:N(Z - (DT - D
     F + 1)) = N(Z):D(Z - (DT - DF + 1)
     ) = D(Z): NEXT Z
1460 I = I - (DT - DF + 1): GOTO 190
```


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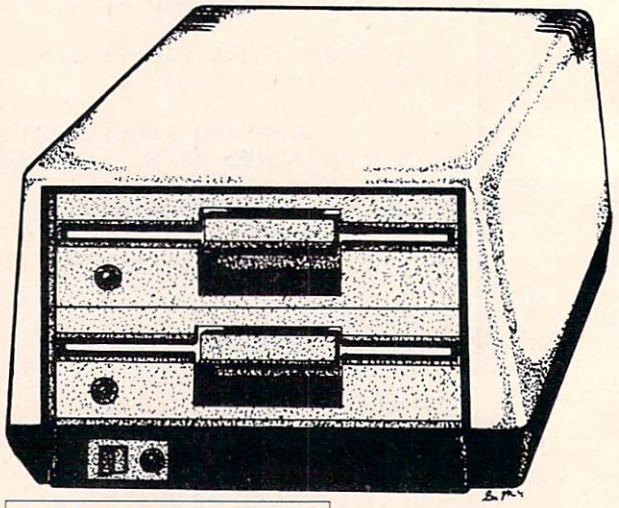

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INSIGHT: Atari

Bill Wilkinson

Bill concludes last month's column with a program demonstrating the capabilities of the new graphics modes.

If you were a little disconcerted by our discussion last month, here is a little BASIC program which demonstrates the capabilities of the new modes in a crude, but visible, fashion. As usual, I will explain the program line by line.

120. Selects a normal GRAPHICS 2. This is our starting point.

130. Prints a reference line on the screen. This is simply so you can tell where the columns of characters are later, when they get MAPped.

150-180. Print what are now normal characters. Note that the underline denotes inverse video characters (via the Atari key). Did you notice that each set of four characters here will produce the MAP patterns 00, 01, 10, and 11 (in that order) on each line of the displayed area? Remember that the other six bits, then, will select a character from character memory.

190, 290, 320, and **340.** Just messages, to tell you what we are doing.

200-220. We are moving the normal Atari 800 character set from its normal location ($E000) to RAM at address $6000. Note: This requires a 32K machine.

230-250. Here we read the DATA statements from lines 380 to 420 and change the character set for the characters A, B, C, and D.

260-280. A quick and dirty way to arbitrarily select some colors for the various color registers.

300 and **330.** Just some delay loops, so you can actually see it happening.

310. Changes the CHBASE (CHaracter BASE pointer) to point to location $6000, where the new character set pattern is.

350. The magic instruction. Look at your screen. How many different colors do you see?

Do you see the relation between the display and the table? Did you notice that the first character in each line "disappeared"? That's because these characters are using MAP 00, the "all background" map.

I think the only thing left is to explain the bit patterns of the modified characters which are read in by lines 230 to 250.

Character A is changed to a solid block of all "11" bits (thus the pattern is eight $FF bytes).

Character B is changed to a solid block of all "10" bits (eight bytes of $AA). Character C is a solid block of "01" bits (eight bytes of $55).

Finally, character D has a purposely varied pattern. The bit patterns in the byte are as follows:

228	$E4	11	10	01	00
57	$39	00	11	10	01
78	$4E	01	00	11	10
147	$93	10	01	00	11

and then the same bytes in reverse order.

The result of the shifted bit pattern shown is, quite naturally, the "arrows" which you see in the program's display.

Finally, we are finished explaining these new modes. What good are they? Just imagine what Chris Crawford could do with a map which displays seven different colors, instead of only four. But surely there are other uses. How about inventing some and sharing them with us?

```
100 REM DEMO OF THE "NEW" GRAPHICS MODE!
110 REM
120 GRAPHICS 2
130 PRINT #6;"wxyz"
140 PRINT #6;"    "
150 PRINT #6;"AaAa"
160 PRINT #6;"BbBb"
170 PRINT #6;"CcCc"
180 PRINT #6;"DdDd"
190 PRINT "THIS IS IN NORMAL GRAPHICS 2"
200 FOR A=24576 TO 25599
210   POKE A,PEEK(A+32768)
220   NEXT A
230 FOR A=24840 TO 28671
240   READ D:IF D<0 THEN 260
250   POKE A,D:NEXT A
260 FOR A=0 TO 8
270   POKE 704+A,18*A+18
280   NEXT A
290 PRINT "THIS IS WITH COLORS CHANGED"
300 FOR I=1 TO 1000:NEXT I
310 POKE 756,96
320 PRINT "THIS IS THE MODIFIED CHARACTER S
    ET"
330 FOR I=1 TO 1000:NEXT I
340 PRINT "FINALLY, THE NEW AND SPECIAL MOD
    E!"
350 POKE 623,128
360 REM == JUST A LOOP TO KEEP DISPLAYING ==
370 GOTO 360
380 DATA 255,255,255,255,255,255,255,255
390 DATA 170,170,170,170,170,170,170,170
400 DATA 85,85,85,85,85,85,85,85
410 DATA 228,57,78,147,147,78,57,228
420 DATA -1
```

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MACHINE LANGUAGE

Jim Butterfield, Associate Editor

Debugging

When you write a program, you're going to make mistakes. It's hard on the ego, but there it is: none of us are perfect. And we cannot consider our program complete unless we have worked out the errors. Not just the obvious ones – those will be easy to spot since they will often prevent the program from running. We need to go further: to methodically search out less obvious bugs and get them out of there.

When a good programmer completes a program and turns to the testing and debugging phase, he or she needs to have something of a split personality. The natural way for us to respond is to hope that there are no bugs, and sometimes that means that we don't try very hard to find them. The smart programmer switches from a Doctor Jekyll coder to a Mr. Hyde tester, mercilessly trying to find weak spots in the program.

There's no fixed procedure for testing. The programmer will try running "ordinary" data through his program, of course, but should also try probing for weak spots – badly formatted lines, operator errors. Test files should be carefully prepared in advance, and output files closely examined after the run.

Debugging Aids

Today's microcomputers seem somewhat weak on formal debugging aids compared to the "big" computers, but this is partly an illusion. Mainframes can't tolerate programmers playing with the toggle switches – time is money, and the machines have many tasks to do. Because of this, elaborate debugging aids have been developed to allow the programmer to trace down troubles away from the computer.

Microcomputers, on the other hand, are often readily available to the programmer; debugging can take place on-line, and the formal aids are needed less.

We can do many things "on-line" on our micros that must be done "off-line" on big machines. For example, a major debugging aid is the "memory dump" – formerly called a "core dump" when memory was made of small magnetic cores. The big-system programmer would receive dozens of pages of memory printout – often in octal or hexadecimal – and might spend hours studying it. The microcomputer programmer, on the other hand, can simply inspect the contents of memory at the computer itself.

There's a style difference, however. A programmer who sits in a cubicle with printout and a pencil is likely to be less hasty in his analysis. On the other hand, a programmer who sits before a memory display on his machine is likely to shout, "I know what it is!" and immediately type in changes and run again. Sadly, most such changes don't work out. When we're in a rush, we tend to try to fix the symptoms rather than the problem.

Let's discuss some of the formal methods available on big computers that can be used on our micros.

The Memory Dump

A program of any significant size leaves a trail behind it in memory. It accepts input, and puts that input somewhere. It uses work areas, builds tables, and computes statistics. It prepares output. All of these leave traces in memory. In fact, experienced programmers often make sure that these values will be there to aid testing. A work area would be cleared immediately before use, not immediately after, so that its contents will be visible until the next use.

Careful examination of memory can be one of the most powerful tools in the debugging repertoire. Everything is there: your program, your data, your work areas. With enough close study, you'll almost certainly find the problem.

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Traces

A *trace* calls on a computer to report every time it passes a given program point. Full traces cause the computer to report every instruction it executes, which creates a great deal of output. *Branch traces* report only the changes in logic flow – branches that are taken, jumps, subroutines that are called, etc. You can tell roughly where a program was working when it got into trouble, since you'll see the last place that it went to a new location. Similarly, you can see the logic flow so that a program can be checked to verify that it did indeed take a given jump.

We have a comparable facility to Trace on our microcomputer; it's sometimes associated with single step. Instructions are displayed on the screen as they are executed. Specialized tools like "branch traces" are less needed; we can watch the program run and see the branches.

Snapshots

The *snapshot* allows you to see a copy of memory at a given time: say, when a particular instruction is executed. It allows you to watch a work area and see how it is built over time.

We can achieve similar results by putting *breakpoints* into our program. These are often just BRK, "break," instructions. Each time we reach a breakpoint, the program will stop, and we may examine memory locations as desired. Then we may allow the program to continue where it left off – until the next break.

The Wolf

You may hear of the "wolf fence" method of debugging. That's just another way of asking your program to tell you when it passes a given point (crosses the "wolf fence"). In this way, you should be able to tell which section of your program contains the bug (the "wolf"). It's just common sense: dividing your program into ever-smaller pieces and checking out each piece.

Debugging is partly an art: some people are very good at it. It's also a science: you must be methodical in making sure your programs work right. But in any case, it's a duty: find your own bugs before other users fall prey to them. ©

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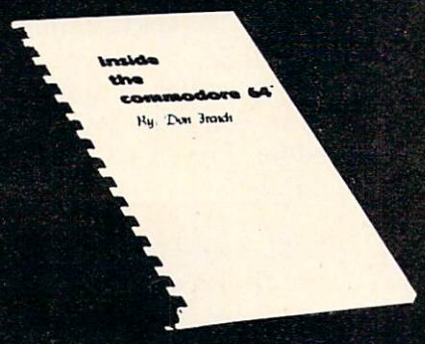

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Phone Directory And Dialer For The TI

Ken McCann

This useful program will work as a phone number file as well as an automatic dialer. It will run on the TI with or without Extended BASIC.

Your computer, cassette recorder, and TV are all you need to run this program. Although it is written in standard TI BASIC, it will run faster if you have Extended BASIC.

DATA statements are included in the program, so only one load is required. Also, with the data files at the beginning of the program, data entry is simple and straightforward. The line numbers and the file numbers are the same, to make updating and deleting less complicated.

DATA Line Format

Enter the name and phone number information for your personal directory in the form shown below (also see line 1 in program for same example):

Line No.	File No.	Name	Phone Number
1 DATA variables (in program)	1, A	MCCANN.K, B$	1,2,3,4,5,6,7 C D E F G H I

The last DATA entry must be followed by an END line. For example:

```
140 DATA   140,END
```

Auto Dialing

In most cases, the accuracy of the frequencies generated with the CALL SOUND statement is not close enough to use as "touch tones" to dial the phone. Therefore, I executed CALL SOUND statements with a frequency counter hooked up to the TV audio output, and added or subtracted until I got the proper frequency.

To use the Auto Dial feature, hold the phone up to the speaker of your TV and press C. Note that you must have a Touch-Tone type phone to use the Auto Dial feature. Two tones were used, and the frequencies for each digit of the phone dial are as follows:

1 697,1209	6 770,1447
2 697,1336	7 852,1209
3 697,1447	8 852,1336
4 770,1209	9 852,1447
5 770,1336	0 941,1336

Program Operation

Search Name and Dial: Type RUN, then press N to enter the Search mode. You are prompted to enter the Name *exactly* as it is in the files and then to press ENTER. The computer will display the DATA item called for. Press C, and the computer will PRINT the number and sound the dial tones for the number.

List: Type RUN, then press L to enter the List mode. You will see DATA as it is in the files. Press C to look at the entire list.

Letter Index List: Type RUN, then press I to enter the Index Mode. Then simply enter the first letter of the last name and press ENTER. The computer will display all the entries beginning with that letter.

Program Explanation

Lines 1-299 can be used for DATA statements. Remember to put the END statement last, after all files are listed.

Lines 300-480 set up the menu.

Lines 510-740 list all DATA items in the order they appear.

Lines 810-990 search DATA for a particular name.

Lines 1000-1820 dial the number and print the file number.

Lines 1830-2030 search for and print all names beginning with a given letter.

Phone Directory

```
1 DATA 1,MCCANN.K,2,1,2,4,4,4,4
2 DATA 2,CLAUSS.S,5,5,5,1,2,1,2
3 DATA 3,NIXON.R,3,3,3,4,5,4,5
4 DATA 4,END
300 CALL CLEAR
```

```
310 PRINT "PHONE DIRECTORY"
320 PRINT "{3 SPACES}& DIALER":::
330 PRINT "SELECT MODE DESIRED"
340 PRINT
350 PRINT
360 PRINT
370 PRINT "LIST ALL ENTRIES
    {6 SPACES}(L)"
380 PRINT
390 PRINT "SEARCH NAME & DIAL
    {4 SPACES}(N)"
400 PRINT
410 PRINT "LETTER INDEX LIST
    {5 SPACES}(I)"
420 CALL KEY(0,KEY,STATUS)
430 CALL SOUND(50,4000,8)
440 IF STATUS=0 THEN 420
450 IF KEY=76 THEN 500
460 IF KEY=78 THEN 780
470 IF KEY=73 THEN 1820
480 GOTO 1260
490 REM
500 REM
510 CALL CLEAR
520 CALL SCREEN(16)
530 PRINT "PHONE DIRECTORY LIST"
540 PRINT
550 FOR Z=1 TO 200
560 PRINT
570 READ A
580 READ B$
590 IF B$="END" THEN 1770
600 READ C,D,E,F,G,H,I
610 PRINT "FILE NUMBER  >";A
620 PRINT
630 PRINT "NAME  >";B$
640 PRINT
650 PRINT "NUMBER>";C;D;E;"-";F;G;H
    ;I
660 PRINT
670 PRINT "PRESS <C> TO PROCEED WIT
    H"

680 PRINT "LIST"
690 REM
700 CALL SOUND(100,1000,2)
710 CALL SOUND(75,675,2)
720 CALL KEY(0,KEY,STATUS)
730 IF STATUS=0 THEN 720
740 IF KEY=67 THEN 760
750 PRINT
760 NEXT Z
770 REM
780 REM{3 SPACES}
790 CALL CLEAR
800 CALL SCREEN(12)
810 REM
820 PRINT "NAME SEARCH"
830 PRINT
840 PRINT "ENTER NAME TO SEARCH FOR
    "
850 INPUT I$
860 PRINT
870 PRINT
880 PRINT
890 FOR S=1 TO 2000
900 REM
910 IF B$="END" THEN 1780
920 READ B$
930 IF B$<>I$ THEN 1530
940 PRINT "INDEX LETTER >";SEG$(B$,
    1,1)
950 PRINT
960 PRINT "NAME >";B$
970 PRINT
980 PRINT "READY TO DIAL"
990 PRINT
1000 PRINT "PRESS >C< TO DIAL NUMBE
     R"
1010 PRINT
1020 CALL SOUND(100,1000,2)
1030 CALL SOUND(75,675,2)
1040 CALL KEY(0,KEY,STATUS)
1050 CALL SOUND(50,2000,6)
1060 IF STATUS=0 THEN 1040
1070 IF KEY=67 THEN 1090
1080 REM
1090 REM
1100 READ C
1110 PRINT C;
1120 N=C

1130 GOSUB 1430
1140 READ D
1150 PRINT D;
1160 N=D
1170 GOSUB 1430
1180 READ E
1190 PRINT E;
1200 N=E
1210 GOSUB 1430
1220 READ F
1230 PRINT F;
1240 N=F
1250 GOSUB 1430
1260 READ G
1270 PRINT G;
1280 N=G
1290 GOSUB 1430
1300 READ H
1310 PRINT H;
1320 N=H
1330 GOSUB 1430
1340 READ I
1350 PRINT I;
1360 N=I
1370 GOSUB 1430
1380 READ A
1390 A=A-1
1400 PRINT "{5 SPACES}"::
1410 PRINT "FILE NUMBER >";A
1420 GOTO 1740
1430 IF N=1 THEN 1540
1440 IF N=2 THEN 1560
1450 IF N=3 THEN 1580
1460 IF N=4 THEN 1600
1470 IF N=5 THEN 1620
1480 IF N=6 THEN 1640
1490 IF N=7 THEN 1660
1500 IF N=8 THEN 1680
1510 IF N=9 THEN 1700
1520 IF N=0 THEN 1720
1530 NEXT S
1540 CALL SOUND(100,1209,0,697,0)
1550 RETURN
1560 CALL SOUND(100,1336,0,697,0)
1570 RETURN
1580 CALL SOUND(100,1447,0,697,0)
1590 RETURN
1600 CALL SOUND(100,1209,0,770,0)
```

```
1610 RETURN
1620 CALL SOUND(100,1336,0,770,0)
1630 RETURN
1640 CALL SOUND(100,1447,0,770,0)
1650 RETURN
1660 CALL SOUND(100,1209,0,852,0)
1670 RETURN
1680 CALL SOUND(100,1336,0,852,0)
1690 RETURN
1700 CALL SOUND(100,1447,0,852,0)
1710 RETURN
1720 CALL SOUND(100,1336,0,941,0)
1730 RETURN
1740 PRINT
1750 PRINT "type >RUN< to start pro
     gram again"
1760 END
1770 PRINT
1780 PRINT "end of list"
1790 PRINT
1800 PRINT "type >RUN< to start pro
     gram over"
1810 END
1820 CALL CLEAR
1830 CALL SCREEN(15)
1840 PRINT "LETTER INDEX LIST"
1850 PRINT
1860 PRINT "ENTER FIRST LETTER IN L
     AST NAME TO SEARCH FOR"
1870 PRINT
1880 INPUT H$
1890 PRINT
1900 FOR Z=1 TO 2000
1910 READ B$
1920 IF B$="END" THEN 1990
1930 IF SEG$(B$,1,1)<>H$ THEN 1980
1940 READ C,D,E,F,G,H,I
1950 PRINT B$
1960 PRINT C;D;E;"-";F;G;H;I
1970 PRINT
1980 NEXT Z
1990 PRINT
2000 PRINT "END OF LETTER INDEX FIL
     E"
2010 PRINT
2020 PRINT "TYPE >RUN< TO START AGA
     IN"
2030 END
```

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Modem Save And Download For The VIC-20

Dennis Colombo

When used together, this series of programs will let you save downloaded VICmodem files and listings. Also included is a program which will convert a downloaded listing to a tokenized BASIC program that you can run. Requires expansion memory.

After I bought my VICmodem, it soon became evident that I needed a way to store all the information which was coming over the line and relentlessly scrolling off the top of the screen. Without a disk drive, I needed a way to store the data on tape so I could later read the information off the screen or edit and make hard copies of selected data such as specific files, airline schedules, or encyclopedia information. Connect time could be appreciably reduced if I didn't have to stop and absorb the information as I received it. With these considerations in mind, I wrote Programs 1, 2, and 3.

Also, there is another type of data which may be retrieved: program listings. While the capability to store and read these listings is useful, they probably won't be in a form your VIC will understand, and they will not run. So I wrote Program 4, which will convert a BASIC listing back into a "tokenized" BASIC program which *will* run.

Machine Language Is More Effective

Program 2 will run the terminal and allow the information to be saved to tape and printed on the VIC printer. It uses 2K of memory; the remaining RAM is utilized as a buffer to hold the information until it is sent to tape or printer. The program was written with a 16K expander, but will work with an 8K or 24K expander. Although it could easily be modified to run without memory expansion, the small amount of memory left for the text buffer would fill up too quickly to be practical.

Program 1 loads VIC to ASCII and ASCII to VIC lookup tables, a machine language subroutine to send and receive data, and a machine language interrupt service routine into memory. I had originally attempted to write the terminal program entirely in BASIC. I found, however, that for receiving large amounts of text, BASIC was too slow. This resulted in buffer overflow and frequent loss of data. The machine language subroutine in Program 1 which handles data reception and transmission is far more effective.

Program 3 will allow you to search through the text in RAM and select portions to be displayed on the screen and sent to the printer.

Program 4 will download a BASIC listing utilizing the "dynamic keyboard" technique. Each line of the BASIC listing in memory is entered as though it is typed directly from the keyboard.

Creating The Modem Save Program

Program 1 should be typed in first. SAVE a copy on tape or disk, since the program destroys part of itself as it is RUN. When you RUN the program, checksums will be calculated to help detect any typing errors you may have made in the DATA statements. If no errors are reported, type NEW, but *do not* reset the computer. It is important that the data which Program 1 POKEs into memory still be there when you type in Program 2. Remember that the NEW command does not clear memory, but only resets pointers.

Program 2 should be typed in exactly as shown; otherwise, when it is RUN, the BASIC pointers may cut off the end of the program. After you finish typing it in, PEEK locations 45 and 46. They should contain the values 49 and 20 respectively. If not, you have either added to or left some-

thing out of the program. SAVE a temporary backup copy at this point in case you have problems with the next step.

Now that you have Program 2 typed in, you must attach the tables and machine language programs which were loaded into memory by Program 1. You can do this by typing POKE 45,1:POKE 46,26 and RETURN. This fools BASIC into thinking that Program 2 includes all the memory up to location 6655, the end of the memory loaded by Program 1. You should now SAVE the new Program 2. All further references to Program 2 are to this version of the program which includes the tables and machine language routines.

To test whether all the data from Program 1 was in fact included in Program 2, type SYS 64802 to clear memory, then LOAD Program 2. Next, type in the following direct mode line and hit RETURN:

```
FOR A=6144 TO 6655: SUM=SUM+PEEK(A): NEXT
  : PRINT SUM
```

If the value reported is 62616, then the data has been included. If not, you'll have to LOAD and RUN Program 1 again, type NEW, LOAD the temporary backup copy of Program 2 you made earlier, then try the POKEs to 45 and 46 and the SAVE again. Once your Program 2 passes this test, you won't need Program 1 again.

You're Ready To Dial

When Program 2 is run, the screen will clear and a cursor (__) will appear in the upper-left corner of the screen. You are now ready to dial up CompuServe or another telecommunications service and connect to the modem. Use the F1 key for Control-C; F3 for Control-P (Break); F5 for Control-Q (resume sending); and F7 for Control-S (stop sending). The interrupt service routine signals with an audible alarm when your text buffer is within 256 bytes of being filled.

You then have the option of logging off and saving your text to tape or printer, or remaining on-line while your text is being saved (about five minutes for 16K) and refilling your buffer with more text. These options are implemented by logging off or by depressing F7 (stop sending) and then pushing the British pound sign key. You will then be asked to select from a menu whether you wish to send the text to tape, printer, or both.

After the SAVE, you will be asked if you are still logged on. If not, the program ends. If you respond that you are still logged on, the program resets the text buffer, clears the screen, and you are ready to continue by depressing F5 (resume sending).

After you have saved your text to tape, you can load it back in at any time and use Program 3 to search and select portions for display and printing. When loading the text back into your VIC, you may occasionally get a ?LOAD ERROR message. Don't be concerned – your data should still be intact. After loading the text tape, type NEW and LOAD Program 3.

When RUN, Program 3 will display a set of instructions. Press the SPACE BAR to start and stop the printing of text to screen as many times as desired. When the text is stopped, the S or E key can be used to mark the start or end of selected text. The starting or ending point will be the last character to appear on the screen before the text is stopped. The memory location of that character will appear on the screen, and you will be given the opportunity to change the start (or end) of selected text by changing this number. Once the end of the text has been marked, press the D key to display the selected text. You will then be asked if you would like a hard copy. Pressing Y will send the selected text to the printer.

I would have preferred that the start of selected text be marked from the top of the screen rather than from the bottom, but I couldn't find a reliable way to correlate the location of a particular portion of text in screen memory to its location in the text buffer due to the inherent inconsistency of the text. The capability to adjust the start and end of selected text after it is marked should help.

If you find a BASIC listing in the text which you would like to download, find the starting address of the listing with Program 3. Type NEW and load Program 4. When this program is run, you will be prompted for the starting address of the listing. Enter the address and RETURN. Each of the listings will then appear briefly, one at a time, near the top of the screen. It may take awhile, depending on the length of the listing, but when it is done, your listing has become a program. You can now delete Program 4 from the end of your downloaded program and SAVE or RUN it.

When Program 4 reaches the end of a program listing, it terminates with an error message. This is due to the absence of a line number or valid BASIC statement. Although this does end the program at the proper point, maybe you can come up with a more elegant way to terminate execution.

Program 2

Line 2 conditions the interrupt service routine to sound an audible alarm when the text buffer is within 256 bytes of being filled. It also changes the IRQ Vector to point to the interrupt routine and sets upper/lowercase mode.

Line 3 moves the top of memory down to protect the machine language routines, lookup tables, and text buffers.

Line 4 resets the BASIC pointers which were moved when the programs were saved. This must

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be done before editing or running any part of the program which contains variable names.

Line 5 opens a file to the RS-232 device and sets the baud rate at 300.

Line 20 sets up a zero page pointer to the start of the text buffer. The machine language subroutine then stores text in the buffer beginning at this location and increments once for each character up to the end of available RAM.

Line 40 calls the machine language subroutine loaded by Program 1 which receives data, prints it to the screen, stores it in memory, and sends data from the keyboard to the RS-232 channel. This loop will continue until the British pound sign key is pressed.

Line 125 turns off the out-of-memory alarm.

Lines 130 through 165 display a menu and call an appropriate subroutine, depending upon which menu item is selected.

Lines 170 through 200 are the subroutine which sends data to the printer.

Lines 220 through 240 are the subroutine which saves to tape all memory from the start of BASIC to the last location of data. This is accomplished by moving the start of variables pointer to the location pointed to by memory locations 1 and 2. This subroutine also ascertains whether or not the user is still logged on, continuing the program if he is and ending it if he isn't.

Program 3

Lines 10 through 28 display the instructions on the screen.

Line 30 sets the beginning of text memory and initializes the start of selected text.

Lines 40 through 130 mark the start and end of selected text.

Lines 140 through 150 print the selected text on the screen.

Lines 160 through 190 print out a hard copy of the selected text on the VIC printer.

Lines 200 through 220 are a subroutine which allows adjusting the start of selected text.

Lines 250 through 280 are a subroutine which allows adjusting the end of selected text.

Program 4

Line 60000 inputs the starting address in memory of the program listing.

Lines 60005 and 60010 clear the screen, print the characters which form the listing one at a time, and look for a carriage return character, signaling the end of a line of BASIC.

Line 60020 increments text memory by one and loops back to print the next character.

Line 60030 is executed when the end of a line of BASIC is detected. POKEing a carriage return into the keyboard buffer at this time causes the text on the screen to be centered as if input were from the keyboard.

Program 1:

Data Tables And Machine Language

```
10 CK=0: FOR A=10240 TO 10495: READ D: CK
   =CK+D: POKE A,D: NEXT A
20 IF CK<>32753 THEN PRINT "DATA ERROR IN
   ": PRINT "LINES 100-410": STOP
30 PRINT "DATA LINES 100-410 OK"
40 CK=0: FOR A=7936 TO 8191: READ D: CK=C
   K+D :POKE A,D: NEXT A
50 IF CK<>29863 THEN PRINT "DATA ERROR IN
   ": PRINT "LINES 420-730": STOP
60 PRINT "DATA LINES 420-730 OK"
70 CK=0: FOR A=6144 TO 6655: D=PEEK(A+409
   6): CK=CK+D: POKE A,D: NEXT A
80 IF CK<>62616 THEN PRINT "DATA RELOCATI
   ON ERROR": STOP
90 PRINT "DATA RELOCATION OK": END
100 DATA 170, 170, 170, 170, 170, 170, 17
    0, 170
110 DATA 170, 170, 170, 170, 170, 13, 170
    , 170
120 DATA 170, 170, 170, 170, 8, 170, 170,
     170
130 DATA 170, 170, 170, 170, 170, 170, 17
    0, 170
140 DATA 32, 33, 34, 35, 36, 37, 38, 39
150 DATA 40, 41, 42, 43, 44, 45, 46, 47
160 DATA 48, 49, 50, 51, 52, 53, 54, 55
170 DATA 56, 57, 58, 59, 60, 61, 62, 63
180 DATA 64, 97, 98, 99, 100, 101, 102, 1
    03
190 DATA 104, 105, 106, 107, 108, 109, 11
    0, 111
200 DATA 112, 113, 114, 115, 116, 117, 11
    8, 119
210 DATA 120, 121, 122, 91, 92, 93, 94, 9
    5
220 DATA 170, 170, 170, 170, 170, 170, 17
    0, 170
230 DATA 170, 170, 170, 170, 170, 170, 17
    0, 170
240 DATA 170, 170, 170, 170, 170, 170, 17
    0, 170
250 DATA 170, 170, 170, 170, 170, 170, 17
    0, 170
260 DATA 170, 170, 170, 170, 170, 3, 16,
    {SPACE}17
270 DATA 19, 170, 170, 170, 170, 170, 170
    , 170
280 DATA 170, 170, 16, 170, 170, 170, 170
    , 170
290 DATA 170, 170, 170, 170, 170, 170, 17
    0, 170
300 DATA 170, 170, 170, 170, 170, 170, 17
    0, 170
310 DATA 170, 170, 170, 170, 170, 170, 17
    0, 170
320 DATA 170, 170, 170, 170, 170, 170, 17
    0, 170
330 DATA 170, 170, 170, 170, 170, 170, 17
    0, 170
340 DATA 170, 65, 66, 67, 68, 69, 70, 71
350 DATA 72, 73, 74, 75, 76, 77, 78, 79
360 DATA 80, 81, 82, 83, 84, 85, 86, 87
370 DATA 88, 89, 90, 170, 170, 170, 170,
    {SPACE}170
380 DATA 165, 2, 201, 127, 144, 13, 169,
    {SPACE}240
```

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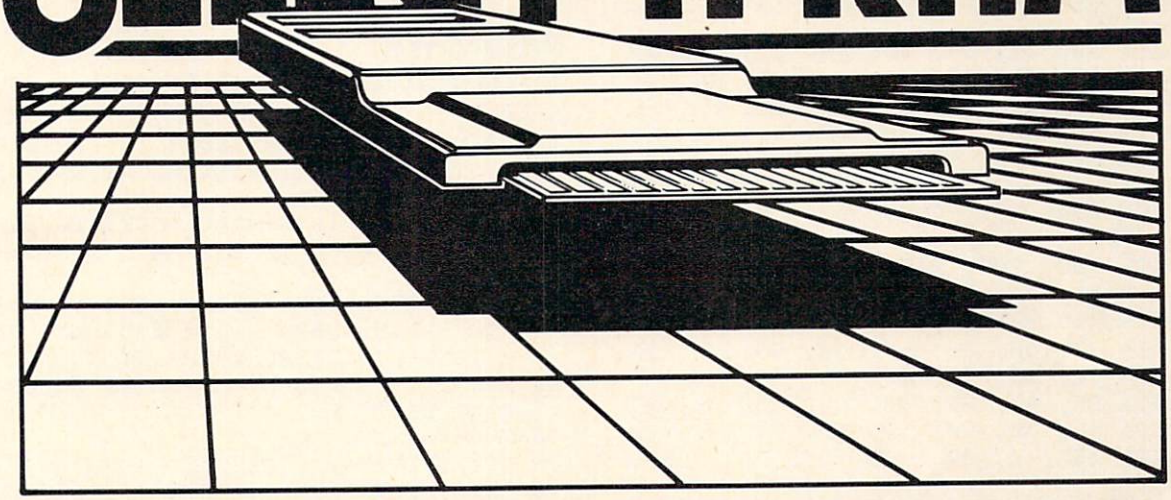

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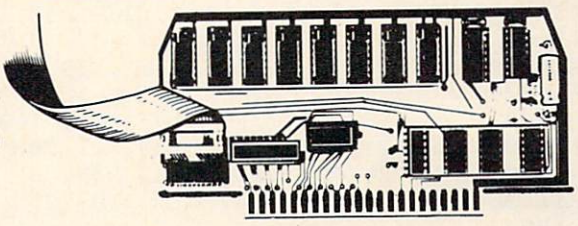

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```
390 DATA 141, 11, 144, 169, 15, 141, 14,
    {SPACE}144
400 DATA 76, 191, 234, 169, 0, 141, 14, 1
    44
410 DATA 76, 191, 234, 170, 170, 170, 170
    , 170
420 DATA 170, 170, 170, 133, 170, 170, 17
    0, 170
430 DATA 20, 170, 0, 170, 170, 13, 170, 1
    70
440 DATA 134, 135, 170, 136, 170, 170, 17
    0, 170
450 DATA 170, 170, 170, 170, 170, 170, 17
    0, 170
460 DATA 32, 33, 34, 35, 36, 37, 38, 39
470 DATA 40, 41, 42, 43, 44, 45, 46, 47
480 DATA 48, 49, 50, 51, 52, 53, 54, 55
490 DATA 56, 57, 58, 59, 60, 61, 62, 63
500 DATA 64, 193, 194, 195, 196, 197, 198
    , 199
510 DATA 200, 201, 202, 203, 204, 205, 20
    6, 207
520 DATA 208, 209, 210, 211, 212, 213, 21
    4, 215
530 DATA 216, 217, 218, 91, 92, 93, 94, 95
540 DATA 32, 65, 66, 67, 68, 69, 70, 71
550 DATA 72, 73, 74, 75, 76, 77, 78, 79
560 DATA 80, 81, 82, 83, 84, 85, 86, 87
570 DATA 88, 89, 90, 59, 60, 61, 62, 20
580 DATA 162, 2, 32, 198, 255, 32, 228, 2
    55
590 DATA 170, 240, 36, 166, 144, 208, 32,
     41
600 DATA 127, 170, 189, 0, 25, 201, 13, 2
    08
610 DATA 3, 32, 218, 25, 32, 210, 255, 160
620 DATA 0, 132, 212, 145, 1, 230, 1, 208
630 DATA 2, 230, 2, 234, 24, 144, 209, 32
640 DATA 204, 255, 169, 164, 32, 210, 255
    , 169
650 DATA 157, 32, 210, 255, 162, 2, 32, 2
    01
660 DATA 255, 32, 228, 255, 240, 7, 170,
    {SPACE}189
670 DATA 0, 24, 32, 210, 255, 32, 204, 255
680 DATA 165, 197, 201, 6, 240, 3, 24, 144
690 DATA 167, 96, 168, 169, 32, 32, 210,
    {SPACE}255
700 DATA 152, 96, 66, 67, 68, 69, 70, 71
710 DATA 72, 73, 74, 75, 76, 77, 78, 79
720 DATA 80, 81, 82, 83, 84, 85, 86, 87
730 DATA 88, 89, 90, 59, 60, 61, 62, 20
```

Program 2: Modem Save

```
1 PRINT"{CLR}{5 SPACES}MODEM SAVE":PRINT:
  FORI=1TO3000:NEXT
2 POKE6371,PEEK(56)-1:POKE788,224:POKE789
  ,24:POKE36869,194
3 POKE644,24:POKE52,24:POKE56,24
4 POKE45,72:POKE46,20:POKE47,72:POKE48,20
  :POKE49,72:POKE50,20
5 OPEN2,2,3,CHR$(6)
20 POKE1,0:POKE2,26
30 PRINT" {CLR}"
40 SYS6528
125 POKE0,PEEK(2):POKE2,26
130 PRINT"{CLR}":PRINT"1. SAVE TO TAPE":P
    RINT"2. PRINTER":PRINT"3. TAPE & PRIN
    TER"
140 PRINT:PRINT"MAKE A SELECTION"
150 GETS$:IFVAL(S$)<1ORVAL(S$)>3THEN150
160 ONVAL(S$)GOSUB220,170,170:IFA$="Y"THE
    N20
165 END
170 OPEN4,4:FORK=8192TOPEEK(0)*256+PEEK(1
    ):PRINT#4,CHR$(PEEK(K)AND127);:NEXT
190 IFS$="3"THEN210
200 RETURN
220 POKE45,PEEK(1):POKE46,PEEK(0):SAVE"MO
    DEM DATA":POKE45,49:POKE46,20
225 PRINT"STILL LOGGED ON?(Y/N)"
230 GETA$:IFA$=""THEN230
240 RETURN
```

Program 3:
Text Search For Display Or Printout

```
5 PRINT"{CLR}":POKE56,26
10 PRINT"THE TEXT RESIDES IN":PRINT"MEMOR
   Y STARTING AT":PRINT"LOCATION 6656":PR
   INT
20 PRINT"PUSH {RVS}SPACE{OFF} TO START":P
   RINT"AND STOP TEXT SEARCH":PRINT
24 PRINT
25 PRINT"PUSH {RVS}S{OFF} AND {RVS}E{OFF}
    TO":PRINT"MARK START AND END":PRINT"O
   F TEXT FOR DISPLAY":PRINT
28 PRINT"{RVS}D{OFF} DISPLAYS SELECTED":P
   RINT"TEXT"
30 J=6656:SA=J
35 GETA$:IFA$<>" "THEN35
40 PRINTCHR$(PEEK(J)AND127);:POKE212,0
50 GETA$:IFA$<>" "THENJ=J+1:GOTO40
60 GETA$:IFA$=""THEN60
110 IFA$="S"THENSA=J:PRINT:PRINT:PRINT"ST
    ART ADDRESS=";SA;"OK?":GOSUB200
120 IFA$="E"THENEA=J:PRINT:PRINT:PRINT"EN
    D ADDRESS=";EA;"OK?":GOSUB250
130 IFA$=" "THENJ=J+1:GOTO40
140 IFA$<>"D"THEN60
150 PRINT:PRINT:PRINTSPC(4)"SELECTED TEXT
    ":FORI=SATOEA:PRINTCHR$(PEEK(I)AND127
    );:NEXT
160 PRINT:PRINT:PRINT"HARD COPY?(Y/N)"
170 GETA$:IFA$=""THEN170
175 IFA$<>"Y"THENEND
180 OPEN4,4:FORI=SATOEA:PRINT#4,CHR$(PEEK
    (I)AND127);:NEXT
190 PRINT#4:CLOSE4:END
200 GETB$:IFB$=""THEN200
210 IFB$<>"Y"THENINPUT"START ADDR.";SA:PR
    INT"{RVS}SPACE{OFF} TO CONTINUE":RETU
    RN
220 PRINT"{RVS}SPACE{OFF} TO CONTINUE":RE
    TURN
250 GETB$:IFB$=""THEN250
260 IFB$<>"Y"THENINPUT"END ADDR.";EA:PRIN
    T"PRESS {RVS}D{OFF} TO DISPLAY":RETUR
    N
280 PRINT"PRESS {RVS}D{OFF} TO DISPLAY":R
    ETURN
```

Program 4: BASIC Download

```
60000 PRINT"START ADDRESS OF":INPUT"PROGR
      AM";I
60005 PRINT"{CLR}{2 DOWN}"
60010 PRINTCHR$(PEEK(I)AND127);:IFPEEK(I)
      =13THEN60030
60020 I=I+1:GOTO60010
60030 PRINT"I="I+2":GOTO60005{HOME}":POKE
      198,2:POKE631,13:POKE632,13
```

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Termulator For The 64

Gordon C. Lyman

"Termulator" is a speedy, machine language program which emulates a terminal program. It thus gives you an alternative if you find BASIC terminal programs too slow or if you cannot find suitable programs available commercially. You don't need to know machine language to type in and use this program. Termulator is limited to full duplex operation.

After buying a Commodore 64 computer and a VICmodem, I soon discovered that the terminal program supplied with the VICmodem would not run on the 64. I tried using a terminal program written in BASIC, but found it too slow for my purposes. Also, I could not find a terminal program offered for sale for the 64, so I wrote "Termulator" (*term*inal em*ulator*), a machine language program which is quite simple in operation.

Basically, the program gets a character from the keyboard, sends the character via modem, receives a character from the modem, and finally displays it on screen. This simple logic limits the program's ability to full duplex operation; however, I have never required anything but full duplex operation. The program utilizes RAM in the range $0900-$8500 as a receive buffer, storing the text displayed on the screen into memory. Termulator consists of three basic sections: initialization, main loop, and cursor subroutine. Let's look at each one in some detail.

Initialization ($C000-$C048)

Termulator uses the Kernal routine "CLALL" ($FFE7) to close all files, just in case any have been left open. Next, the value $00 is stored in the RS-232 command register ($0294) and the value $06 is stored in the RS-232 control register ($293).

The next instructions set up a filename for the modem file. The location of the filename is loaded into the X and Y registers, and the length of the name is loaded into the accumulator. Now the important part: the first two bytes of the modem filename must be the RS-232 control and command registers. Then, by using the Kernal routine "SETNAM" ($FFBD), the RS-232 interface is instructed to operate according to the RS-232 control and command registers. In this case, the RS-232 interface will operate at 300 baud, with no parity checking, one stop bit, and an eight-bit word length. In order to change these, you must change the values that are loaded into these registers. For further explanation, see the *Commodore 64 Programmer's Reference Guide.*

A pointer in the zero page of memory is initialized to the start of the receive buffer. This buffer starts at $0900 in order to leave a cushion between the start of BASIC at $0800 and the buffer area. The pointer will be used by the main routine to store the text received into this buffer for future manipulations. The limit of memory pointer is reset in order to protect the file buffers which will be allocated when opening a file for the modem. The limit of memory pointer is also set low enough to protect a monitor or other program stored within the top 6656 bytes of RAM.

The program next sets up the logical first and secondary addresses and opens the modem file. This automatically allocates 512 bytes at the top of free RAM for input and output buffers. The accumulator is loaded with the file number, the X register is loaded with the device number, and the Y register is loaded with the secondary address, which would be a command to the modem. The value $FF loaded into the Y register means no command to the device. Then the "SETLFS" ($FFBA) and "OPEN" ($FFC0) Kernal routines are called.

The ASCII data from $C0F4 is displayed until a zero value is found. This includes the character codes to change to upper/lowercase and display white characters, as well as a title message.

The Main Loop ($C04A-$C0BF)

The Kernal routine "STOP" ($FFE1) is called, which will return a $00 in the accumulator if the stop key is pressed. If the stop key is pressed, all files are closed and the program stops; otherwise, the program branches to set the input device to device number 0 (the keyboard).

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The Kernal routine "GETIN" ($FFE4) is used to return one byte from the keyboard buffer as an ASCII value in the accumulator. If the keyboard buffer was empty, a $00 is returned and the program will branch to the modem input routine. Otherwise, the ASCII value from the keyboard is stored in a zero page location ($6A) for later processing. The ASCII value from the keyboard is translated into standard ASCII by selecting the corresponding value from a list, 256 bytes long, starting at $C226. This is required because Commodore ASCII is not the same as standard ASCII. Also in this list of data are the ASCII values for the Control A through Control Z. When you wish to send a control character while using the program, type the appropriate letter key while holding down the Commodore key. Another list, starting at $C126, contains the Commodore ASCII for the reverse translation. The Kernal routine "CHROUT" ($FFD2) is used to send the byte, now in the accumulator, over the modem.

The Kernal routines "CHKIN" ($FFC6) and "CHRIN" ($FFE4) are used to input a byte from the modem. Then this byte, which is standard ASCII, is translated to Commodore ASCII and stored in zero page (at $6A).

If the value returned from the modem was null ($00), the program will branch back to the beginning of the main routine.

To erase the cursor before outputting to the screen, a space and cursor-left are displayed. Then the byte that was received from the modem is printed on the screen.

A check is made to see if the character received, now in the accumulator, is a delete. If it is, the receive buffer pointer is decremented and the program returns to the start of the main loop; if not, the receive buffer pointer is incremented. If the pointer has reached the limit of memory pointer, it is reset to $0900. The character is stored in the receive buffer, and the program returns to the start of the main loop.

The Cursor Subroutine ($C0C0-$C0F3)

The least significant byte of the Commodore 64's jiffy clock is used as a timer for the cursor. This byte is compared to the value $15, which is the length of time the cursor takes to flash on or off. By changing this value in location $C0C3, you can change the speed at which the cursor flashes. If the timer has not expired, then the RTS instruction at $C0C6 will return to the main routine.

If the timer has expired, it is reset and a flag stored at $6B is checked. This flag will be either $00 or $FF. If the flag is set to $FF, it will be cleared to $00 and a space which turns the cursor off will be displayed.

If the flag was clear, then the program branches to set the flag to $FF and displays a reversed space which turns the cursor on. After the cursor is turned either on or off, a cursor-left is displayed. This is done so that the next thing displayed will be in the right position. The program then returns to the main routine.

How To Use Termulator

Type in and RUN Program 1, which is a BASIC program that will load the machine language for Termulator into RAM. If any errors are detected, it will display the message ERROR IN BLOCK # x. You will need to check from $C300 to $C337 by hand. If no errors are found, the program is ready to run. Just type SYS 49152.

Once you've got a working version of Termulator, you can eliminate the trouble of having to run the BASIC loader program again by making a copy of the machine language on tape or disk. To do this, you'll need either a monitor program or a program like "Machine Language Saver" (COMPUTE!, June 1983). SAVE the contents of memory from 49152-49976 ($C000-$C338). When you reload the machine language, you start the program just as before, by typing SYS 49152.

Alternatively, you could use Program 2. This POKEs in a short routine which creates a tape copy of the Termulator machine language. Type in and RUN Program 2, insert a blank tape in the datassette, and type SYS 52736. You should see on your screen the prompt PRESS PLAY & RECORD ON TAPE, at which point you are ready to make the copy. You can reload Termulator from this tape by typing LOAD " ",1,1.

Program 1: Termulator — BASIC Loader

```
100 FOR M=49152 TO 49975
110 READ D:POKE M,D:NEXT
120 FOR L=0 TO 11
130 LN=L*70+49152
140 FOR C=0 TO 69
150 IF LN+C>49975 THEN 180
160 T=T+PEEK(LN+C)
170 NEXT C
180 READ CS
190 IF CS<>T THEN PRINT"ERROR IN LINES";L
    N;" -";LN+63:STOP
200 T=0:NEXT L
210 PRINT"{3 DOWN}TERMULATOR LOADED SUCCE
    SSFULLY{2 DOWN}"
220 PRINT"TYPE SYS 49152 TO START"
230 END
49152 DATA 32,231,255,169,0,141,148
49159 DATA 2,169,6,141,147,2,169
49166 DATA 0,133,97,133,99,169,9
49173 DATA 133,98,169,133,133,56,169
49180 DATA 2,162,147,160,2,32,189
49187 DATA 255,169,128,162,2,160,255
49194 DATA 32,186,255,32,192,255,169
49201 DATA 240,141,32,208,169,240,141
49208 DATA 33,208,162,0,189,244,192
49215 DATA 240,9,32,210,255,232,76
49222 DATA 60,192,234,234,32,225,255
49229 DATA 208,4,32,231,255,0,162
49236 DATA 0,134,153,32,228,255,240
```

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The program also allows you to design your own report formats. Your reports may include:

Automatic record counting
Computation between fields
Totals and/or sub-totals per column
Record selection by one or more fields

TECHNICAL NOTE

This program supports the serial or the user port —you can configure just about any printer. It can be used with more than one 1541 disk drive or with the "C-64 Link-IEEE Interface" which allows you to work with the Commodore 2031, 4040, and 8050 disk drives.

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```
49243 DATA 22,133,106,201,133,208,3
49250 DATA 32,55,195,162,128,32,201
49257 DATA 255,166,106,189,55,194,32
49264 DATA 210,255,162,128,32,198,255
49271 DATA 32,228,255,170,189,55,193
49278 DATA 133,106,162,3,134,154,32
49285 DATA 192,192,165,106,240,191,169
49292 DATA 32,32,210,255,169,20,32
49299 DATA 210,255,165,106,32,210,255
49306 DATA 201,20,208,11,164,99,208
49313 DATA 2,198,98,198,99,76,74
49320 DATA 192,230,99,208,12,230,98
49327 DATA 164,98,196,56,208,4,160
49334 DATA 9,132,98,164,99,145,97
49341 DATA 76,74,192,165,162,201,21
49348 DATA 16,1,96,160,0,132,162
49355 DATA 164,107,240,12,160,0,132
49362 DATA 107,169,32,32,210,255,24
49369 DATA 144,19,160,255,132,107,169
49376 DATA 18,32,210,255,169,32,32
49383 DATA 210,255,169,146,32,210,255
49390 DATA 169,157,32,210,255,96,5
49397 DATA 14,147,17,17,17,17,17
49404 DATA 17,32,32,32,32,32,32
49411 DATA 32,212,197,210,205,45,213
49418 DATA 45,204,193,212,207,210,32
49425 DATA 32,157,157,13,13,32,32
49432 DATA 32,32,32,32,32,32,32
49439 DATA 32,66,89,32,199,46,32
49446 DATA 204,89,77,65,78,13,13
49453 DATA 13,0,234,0,0,0,0
49460 DATA 0,0,0,0,0,0,137
49467 DATA 0,0,0,0,20,0,0
49474 DATA 0,0,13,0,0,146,134
49481 DATA 0,138,0,0,0,0,0
49488 DATA 0,0,0,0,0,0,0
49495 DATA 32,33,39,35,36,37,38
49502 DATA 39,40,41,42,43,44,45
49509 DATA 46,47,48,49,50,51,52
49516 DATA 53,54,55,56,57,58,59
49523 DATA 60,61,62,63,64,193,194
49530 DATA 195,196,197,198,199,200,201
49537 DATA 202,203,204,205,206,207,208
49544 DATA 209,210,211,212,213,214,215
49551 DATA 216,217,218,91,92,93,94
49558 DATA 95,0,65,66,67,68,69
49565 DATA 70,71,72,73,74,75,76
49572 DATA 77,78,79,80,81,82,83
49579 DATA 84,85,86,87,88,89,90
49586 DATA 0,0,0,0,0,0,0
49593 DATA 0,137,0,0,0,0,20
49600 DATA 0,0,0,0,13,0,0
49607 DATA 146,134,0,138,0,0,0
49614 DATA 0,0,0,0,0,0,0
49621 DATA 0,0,32,33,34,35,36
49628 DATA 37,38,39,40,41,42,43
49635 DATA 44,45,46,47,48,49,50
49642 DATA 51,52,53,54,55,56,57
49649 DATA 58,59,60,61,62,63,64
49656 DATA 193,194,195,196,197,198,199
49663 DATA 200,201,202,203,204,205,206
49670 DATA 207,208,209,210,211,212,213
49677 DATA 214,215,216,217,218,91,92
49684 DATA 93,94,95,0,65,66,67
49691 DATA 68,69,70,71,72,73,74
49698 DATA 75,76,77,78,79,80,81
49705 DATA 82,83,84,85,86,87,88
49712 DATA 89,90,0,0,0,0,0
49719 DATA 0,0,0,0,0,0,0
49726 DATA 0,0,0,0,0,0,13
49733 DATA 0,0,0,0,0,0,8
49740 DATA 0,0,0,0,0,0,0
49747 DATA 0,0,0,0,32,33,34
49754 DATA 35,36,37,38,39,40,41
49761 DATA 42,43,44,45,46,47,48
49768 DATA 49,50,51,52,53,54,55
49775 DATA 56,57,58,59,60,61,62
49782 DATA 63,64,97,98,99,100,101
49789 DATA 102,103,104,105,106,107,108
49796 DATA 109,110,111,112,113,114,115
49803 DATA 116,117,118,119,120,121,122
49810 DATA 91,92,93,94,95,0,0
49817 DATA 0,0,0,0,0,0,0
49824 DATA 0,0,0,0,0,0,0
49831 DATA 0,0,0,0,0,0,0
49838 DATA 0,0,0,0,0,0,0
49845 DATA 0,0,0,0,0,0,0
49852 DATA 3,17,19,0,3,19,0
49859 DATA 0,0,0,0,0,0,16
49866 DATA 0,0,0,0,0,0,0
49873 DATA 0,0,0,0,0,0,0
49880 DATA 11,9,20,0,7,0,13
49887 DATA 0,0,14,17,4,26,19
49894 DATA 16,1,5,18,23,8,10
49901 DATA 12,25,21,15,0,6,3
49908 DATA 24,22,2,0,65,66,67
49915 DATA 68,69,70,71,72,73,74
49922 DATA 75,76,77,78,79,80,81
49929 DATA 82,83,84,85,86,87,88
49936 DATA 89,90,0,0,0,0,0
49943 DATA 0,0,0,0,0,0,0
49950 DATA 0,0,0,0,0,0,0
49957 DATA 0,0,0,0,0,0,0
49964 DATA 0,0,0,0,0,0,0
49971 DATA 0,0,0,0,96
50000 DATA 9342,10115,8611,7872,2344,7993
50010 DATA 2536,8449,1657,3439,1123,1416
```

Program 2: Termulator – Tape Copy

```
100 FOR M=52736 TO 52760
110 READ D:POKE M,D:CK=CK+D:NEXT
120 IF CK<>3515 THEN PRINT"ERROR IN DATA
    {SPACE}STATEMENTS":STOP
130 PRINT"{2 DOWN}INSERT TAPE AND TYPE"
140 PRINT"{DOWN}{5 RIGHT}SYS 52736"
150 END
160 DATA 162, 1, 32, 186, 255, 169, 0
170 DATA 133, 106, 32, 219, 255, 169, 192
180 DATA 133, 107, 169, 106, 162, 69, 160
190 DATA 195, 32, 216, 255
```


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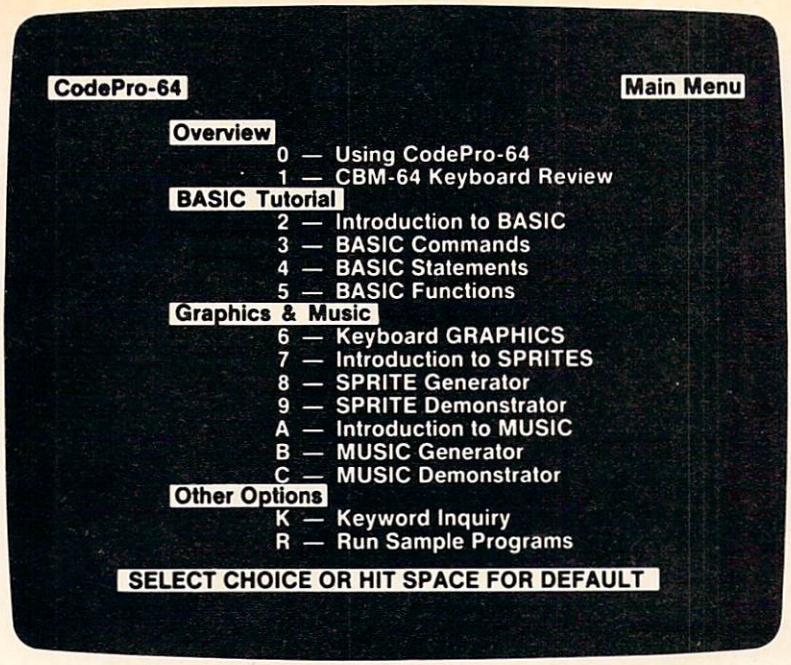

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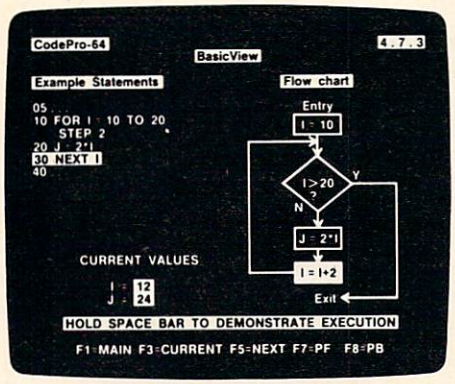

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By seeing graphic displays of program segment execution you learn by visual example. You **learn faster and grasp programming concepts easier** with CodePro-64 because you immediately see the results of your input.

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CodePro-64 **lets you follow your interests** and practice with interactive examples. But you can never get "lost". F1 will always return you to the main menu. Once you have practiced and mastered the BASIC language elements you move on to more advanced concepts. You learn about sprite and music programming.

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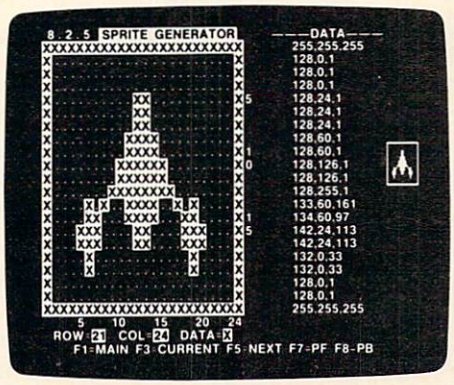

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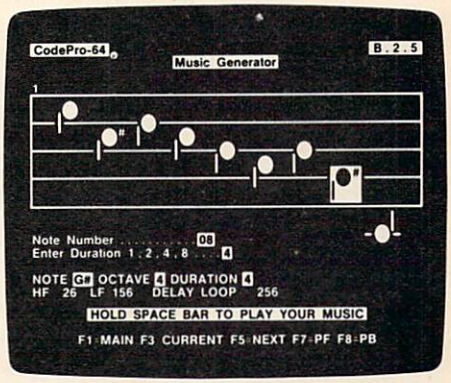

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C. Regena

Answers To Common Questions

I have appreciated your comments and feedback. Your letters help me in several ways to write a better column. I thought this month I would try to answer some general questions that I frequently see. Most of the questions concern peripherals or debugging, so I'll discuss these two main topics this month.

Do You Really Need Peripherals?

Peripherals are anything extra that you add on to your computer. To use your TI-99/4A, all you really need is the computer itself, a television or monitor so you can see what you're doing, the cord to connect the television and the computer, and the power cord (these cords are included with the computer). If you are writing your own programs, purchasing programs on cassette, or typing programs from magazines, you will need a cassette recorder and a cassette cable. You can use just about any kind of cassette recorder, but the TI Program Recorder is more reliable. The TI-99/4A console seems quite sensitive to the setting of the volume control. Your recorder does need to have a volume control and a tone control. Your *User's Reference Guide* tells how to use the cassette recorder.

To save a program you've written or typed in, use the command SAVE CS1 then press ENTER and follow the cassette instructions. To load a purchased program or a previously saved program, use OLD CS1 and follow the instructions. After you have pressed STOP on the cassette and ENTER on the keyboard, wait for the cursor to return (it may take a few seconds on longer programs), then type RUN to start the program.

By the way, as you are typing in a program, it's a good idea to SAVE your program every 20 minutes or so. It's a disaster to have a program all typed in after hours of effort, then have a sudden power failure that wipes out your program. I always use two cassettes and alternate them during the SAVE procedure just in case the power fails while I'm saving the program.

Most of my writing is for unexpanded computers with no peripherals other than the cassette. TI computers are very powerful machines just as they are, and I like to show readers how much they can do without investing any more money. The TI has many nice features and a very powerful built-in BASIC. The average household or educational user will not need any peripherals to enjoy and use the TI.

What Do You Buy First?

Many computer users soon want to do even more with their computers and begin to add peripherals. Many readers ask what peripherals to buy, and I can't really answer that because it depends on what *you* want to do with the computer. I added a printer first because I needed (wanted) listings of the programs I was writing. Other people can't live without a disk drive, so that's their first purchase.

There are many, many brands of printers available. To use a printer with the TI you need the RS-232 Interface; just make sure your printer is RS-232 compatible. My first printer was an old teletype. If you need to make a cable to connect the printer to the RS-232, the RS-232 manual has the pin connections and all the configuration information. My next printer included the cable – so work with your dealer to make sure you have everything you need.

It is still possible to use just the RS-232 without the peripheral box (known as the "old-style" peripheral system). If the only peripheral you will need is the RS-232, it is unnecessary to buy the Peripheral Expansion Box plus the RS-232 Interface Card. In fact,if you have the Peripheral Box, you can use the old-style RS-232 or the RS-232

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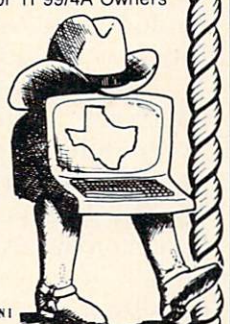

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card. If you have the old-style RS-232, just plug the Peripheral Box flex cable into the side of the RS-232.

Using the Peripheral Expansion Box is the present method of adding on peripherals to the TI. Inside the box are slots for various cards. There is also room for one disk drive to be inside the box. You may add cards as they become available (or as you can afford them or need them).

A disk drive can be used in many ways. To add a disk drive you also need the Disk Controller box or the Disk Controller card and the Peripheral Expansion Box. The main advantage of a disk system over a cassette system is speed. You may SAVE programs on disk just as on cassette. A full-memory program may take about 3 minutes to load with cassette but only about 20 seconds with the disk system. The disk system is also much faster on any file processing, and thus practically a necessity for business programs. Many business programs require two disk drives. One disk controller can control up to three disk drives. Disk systems are possibly undesirable for some home use or for use in elementary schools because the cassette system is easier for children to use, less expensive, and not as fragile.

The 32K Memory Expansion is available either as a separate box or as a card to go in the Peripheral Expansion Box. One irate reader wrote that in my January column I did not mention that to add the Memory Expansion you also have to buy the Peripheral Expansion Box. The answer is that the Memory Expansion is still available separately in a box that attaches to the side of the computer. The Peripheral Expansion Box is the best way to go if you are adding several peripherals, but if you need only one unit the "old-style" still works. The 32K Memory Expansion does require a command module that can access it. You cannot use the Memory Expansion with the built-in BASIC. TI Extended BASIC and Logo are examples of two of the modules that can use the Memory Expansion.

Computer Enhancements

A modem allows telecommunication – you can connect your computer through telephone lines to another computer such as a large data base or a mainframe "host" computer. Your home computer thus acts as a terminal. To use a modem you'll need the RS-232 Interface and the Terminal Emulator command module. The RS-232 has two ports so you can interface with both a printer and a modem. There are two terminal emulator command modules, and either one will work. They contain the software necessary to set up the communications. Terminal Emulator II also contains speech capabilities, so it is a dual-purpose module. There are many brands of modems and telephone couplers; you just need to make sure the one you use is RS-232 compatible.

The Speech Synthesizer is the peripheral that makes the computer talk. With the "free speech" offer (buy six command modules and get the Speech Synthesizer free), every home with young children should get one. The speech feature adds an extra touch to educational programs. To enable the computer to talk, you need a command module that has speech capabilities.

To program your own speech, you'll need Terminal Emulator II. Words are pronounced phonetically, or you can use numbered allophones, so programming speech takes some experimentation. You can also use the TI Extended BASIC module, but this module has limited speech – only a certain vocabulary (and variations of those words) can be used.

Wired Remote Controllers are available for games or for educational programs. The TI version comes as a pair of joysticks for two-player games.

With a Hex-Bus adapter you can save a program with the Texas Instruments Compact Computer 40 (CC-40) onto wafertape, then load it onto the TI-99/4A.

Alternatives To BASIC

Several languages are available for the TI-99/4A. TI Extended BASIC is probably the first one I would get for someone who likes to program. Extended BASIC comes as a command module, and no extra peripherals are required. Extended BASIC allows multistatement lines, actual subprograms, and complex IF-THEN-ELSE logic. If you like to convert programs from other versions of BASIC, Extended BASIC makes it a little easier. Another feature of Extended BASIC is the DISPLAY AT command to print at a specific location on the screen – and the PRINT USING command allows formatting, which makes it easier to print reports or line up numbers in a column of numbers.

Another main feature of Extended BASIC is sprite capability. You may custom design your own objects just like in TI BASIC, but then you can place the sprite on the screen, designate a color, and put the sprite in motion (all in one statement). For people who like to design games, Extended BASIC is a must. The sprites are a lot of fun to work with.

Logo and Logo II are command modules which are popular in introducing children to programming. The TI version of Logo allows all the common turtle commands, and you can define your own characters and choose colors. The Logo II version has music capabilities. To use Logo or Logo II, you need the memory expansion. If you are a teacher using Logo, be sure to get the *Logo Curriculum Guide*. It is a manual of excellent ideas

for using Logo in the classroom. It also includes sample programs.

For machine language, you can get the Editor/Assembler cartridge. The 32K Memory Expansion, Disk Drive, and Disk Controller are required. A less expensive way to try machine language is to use the Mini-Memory module (no peripherals required).

Another language available to TI users is Pascal. Peripherals required are the P-Code Card, 32K Memory Expansion, Disk Drive, Disk Controller, and Peripheral Expansion Box.

I'm sorry I cannot answer your questions about machine language or Pascal. My programming so far has been in BASIC (for several computers) and TI Extended BASIC.

Why Won't The Program Run?

Now to the second main topic – debugging. *Debugging* is a computer term which means finding what's wrong with a program that doesn't work correctly. This month I'd like to give you some tips on how you might pinpoint errors in a program you've typed in but won't run correctly.

Syntax errors are the easiest to find and correct. If you RUN the program, it will stop at any syntax error and tell you exactly what's wrong and in which line. *Syntax* usually refers to a typing error such as a word spelled incorrectly, a comma in the wrong place, unmatched parentheses or quotes, or the wrong number of parameters in a CALL command. The TI catches a lot of typing errors as you are typing in the lines. Others are detected as the program is RUN. Remember that you can type the line number then the down arrow (with FCTN on the TI-99/4A and SHIFT on the TI-99/4) to edit a particular line, then use the arrow keys to move the cursor to the error.

Check line numbers in program transfer statements – GOTO, GOSUB, ON-GOTO, ON-GOSUB, and IF-THEN-ELSE statements. One digit can make a difference in the proper program control. For example, my coordinate geometry program in the February 1983 issue had a typesetting error. Line 760 should have been GOSUB 1860 instead of GOSUB 1850. That one digit caused an error. Several people wrote in very complex solutions to a problem I didn't know existed until I compared line numbers and noticed that one digit. This was one case where there really was a printing error. Now COMPUTE! has the listings printed directly from the computer to avoid such errors.

Check Your DATA Statements

Check to make sure DATA statements are typed correctly. If your program has DATA statements and doesn't run properly, the most likely place for a typing error is in a DATA statement. You may want to review the description of DATA statements in your *User's Reference Manual* or my August 1983 column on DATA and READ statements so you can follow the logic of the READ statements and corresponding DATA statements.

If you get a DATA ERROR, you may not have enough data items to fulfill the READ requirements. The line number given in the error message is the READ statement, so you'll have to find the corresponding DATA statement. Check the DATA statements for the proper placement of commas. It is possible there are commas together with nothing between them – this indicates a null string or "", and every comma is necessary. Also, make sure you do *not* have a comma at the end of a DATA statement.

Another type of DATA error is that the computer is trying to read a numeric value but gets a string (letters). Again, check the commas. Also make sure you haven't mistyped the number zero and the letter O.

If you have a lot of DATA statements, your eyes may get tired trying to compare printed statements with your typed statements. To try to pinpoint the trouble spot, LIST the lines around the READ statement referred to in the DATA error message. Remember you can list specific lines, such as LIST 640-660. Now PRINT the variables you are reading to find the last good values that were accepted. If you are reading within a FOR-NEXT loop, you can PRINT the index counter to see how far along the loop you are.

Anytime the program stops (BREAK), in this case with an error message, and as long as you don't do any editing, you may PRINT the value of any variable. For example, you may type PRINT B and press ENTER, and the present value of B will be printed. You can then look in the DATA statements to see where that particular value is. The value printed will be the last acceptable value for B, so the next couple of items may contain the error.

An error in a DATA statement may actually cause a problem in a statement other than a READ statement. For example, suppose you have this section of a listing:

```
650 FOR I=1 TO N
660 READ X,Y,G
670 CALL HCHAR(X,Y,G)
680 NEXT I
```

You could get the error message BAD VALUE IN 670. This means X, Y, or G is not acceptable. X must be a number from 1 to 24 for the row number, Y must be from 1 to 32 for the column number, and G must be an ASCII code number. You can PRINT X;Y;G to see what the values for X, Y, and G are. The next step is to see how you got the bad value. In this case, line 660 READs the values from DATA, so you can search through the DATA

statements to find a sequence of the three numbers the computer printed. The error will probably be a typing error just before those numbers.

Other Common Errors

There are also errors unrelated to DATA statements. FOR-NEXT errors are usually not difficult to find. Every FOR statement must have a corresponding NEXT statement. Once in a while, however, you can search and search and everything seems matched up correctly. The most likely cause for the error is that a line just before a FOR statement or just before a NEXT statement has 28 characters (or a multiple of 28), so the cursor goes to the next line. You need to press ENTER, but the cursor makes you think you have already pressed ENTER, and you may go ahead and type the next line. The result is a run-together line. If you list that line among several others, they all look right because the numbers line up properly.

To see if this is the problem, LIST only the line containing the FOR or the NEXT to see if it's really there. Warning: The FOR-NEXT error message may list a line number that is really OK; the run-together FOR or NEXT statement may occur before the one listed in the error message. If you use the automatic numbering feature as you type in programs, this problem is less likely to occur.

The run-together line problem may occur anytime you are typing lines that have 28 characters and could cause other problems.

A "glitch" type problem may occur in ON-GOTO and ON-GOSUB statements. The line should be typed in the following example form:

```
200 ON A GOTO 340,550,760,800
```

where there are no spaces between the line numbers. If you happen to type a space in between line numbers then later LIST the line, the space will not be there but it could still be causing an error. If you suspect you are having trouble with an ON-GOTO or ON-GOSUB statement, retype the whole statement. By the way, don't try to second-guess the author. The line numbers do not have to be in numerical order, and you can use the same line number in several of the positions.

These are answers to the most common questions I've been asked. If you still have problems getting a program to run, you may write to me. Be sure to tell me which program you are typing, which computer you are using, the exact error message with the line number, and what happens plus whatever other conditions may contribute to the problem. I want you to be able to use and enjoy these programs; however, it is difficult for me to help you debug if I don't know the exact conditions and line numbers. Please do not ask me how to solve problems with programs written by other authors.

Also, please do not ask me to debug one of your programs or to write a program (or convert a program) for you. It isn't your project if I do it for you, and the joy of programming is accomplishing your own goals. I also am not set up to review programs for you. You may submit them to COMPUTE! directly. I *do* welcome comments or suggestions for future columns that will interest the general TI user.

Since I haven't written about a specific programming technique this month, here's a short graphics display program to try this time. I'll try to have a Christmas present for you in my December column.

```
100 DEF R=INT(16*RND+1)
110 RANDOMIZE
120 FOR I=1 TO 16
130 CALL SOUND(-50,R*110,4)
140 CALL COLOR(I,R,R)
150 CALL SCREEN(R)
160 CALL HCHAR(R+4,R*2,R*R/2,R*R)
170 CALL VCHAR(R+4,R*2,R*R/2,R*R)
180 NEXT I
190 GOTO 110
200 END
```

Line 100 defines a function R to be a random integer from 1 to 16. Every time R is used in later lines, R will be a random integer from 1 to 16 – a lot less typing by using the DEFinition function.

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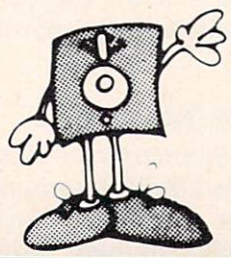

Micros With The Handicapped

Susan Semancik & C. Marshall Curtis

Developing A Communications Program

This is the final column in the series on developing a communications program for the handicapped. The final version of the program, written for the VIC with at least 8K RAM, has the following features:

1. Multiple menu selection, with menus stored within the program.
2. A joystick button used as a one-movement, alternative input device.
3. A faster scanning algorithm used in a passive selection process.
4. Input options:
   a. Changing the rate of scanning and the time in which to make a selection.
   b. Changing the menu being displayed.
   c. Storing messages within the program, which can be retrieved in any order.
   c. Audible signal when message is ready for viewing.
   e. Erasing characters, words, or sentences within the current message, or erasing a stored message.
   f. Saving the program with its menus and messages.
5. Word and character selection from the same menu.
6. Automatic spacing after words and prevention of word-splitting in messages.

User Options

The top line of the screen displays the input options in green. If one is selected, its choices are presented in cyan on the second screen line. The next 13 screen lines are used for menus, which are displayed in blue. Any messages are reverse-fielded in red in the bottom 8 screen lines.

Instead of every menu entry being scanned until the user responds, the columns of the menu and options are alternately scanned until one is selected. If a menu column is chosen, its rows are scanned until no more selections are made from that column.

A "debouncer" line has been added to the input routine so that the selection timing isn't started until the joystick button is released. This should help avoid unexpected and unwanted multiple selections.

When the message area is filled, the user cannot add to it until after selecting the message erase option. This allows the user to first save the message or signal someone to read it. A saved message is erased by referring to it by a positive number under the ERASE option. Choosing a zero instead will clear the message display area for further message formation.

The message review option allows multiple messages to be displayed in any order. Any current message is preserved, and then restored after the review mode is done.

To make the program easier to use by people with limited computer experience, menus and messages are stored in the program within DATA statements. The program adds new messages to DATA statements by means of the "dynamic keyboard" method. The first DATA statement contains information that the program updates when the user changes response time or the number of stored messages. Then enough DATA line numbers have been reserved for nine messages, each taking up four DATA lines. The remaining DATA lines contain menu parameters and menu entries by rows.

Suggestions

The complete program with all of its features will not fit in an unexpanded VIC. We suggest at least an 8K system to make this a useful communication

tool. If you eliminate multiple menus and some of the input options, and limit the number of messages to be stored even further, you can make the program fit in the unexpanded VIC.

One helpful addition would be the ability to change an entry of a menu or add a new menu. This would allow the user even greater independence in creating a tailored communication tool.

We hope that this series has been helpful to you, or at least given you a new perspective on designing specialized communication programs for the handicapped. There are many other ways to approach the problem, but most of these require a larger and more expensive system than we have considered here. For those wishing to further explore this topic, we recommend the June 1983 issue of *IEEE MICRO* magazine, which contains an excellent article and references on computerized, anticipatory letter-selection programs.

There are also many new computer interface devices being developed for the handicapped user. For instance, an Atari compatible joystick that is mouth operated is being advertised for $65 by KY Enterprises, 195 Claremont, Suite 288, Long Beach, CA 90803, (213)433-5244.

If anyone knows of other computer programs or devices to help the handicapped, or if anyone develops enhancements to our final program, please let us know and we will share the information with the rest of our readers in this column. You can contact us through Jean Trafford, Secretary, The Delmarva Computer Club, P.O. Box 36, Wallops Island, VA 23337.

VIC Communications Program

```
10 W=22:PM=8*W:DIMS(W),L(W),O$(11):SP=409
   6:CP=37888-SP:XJ=37137
14 POKE37139,0:SM=SP+W*23-PM:S=36876:P$="
   .?↓"
20 GOSUB950:PRINT"{CLR}{GRN}";I$;"{BLU}":
   FORI=0TOPM-1:POKESM+I+CP,2:NEXTI
50 GOSUB1010:IFTTHENGOSUB1970:T=0
60 P1=SP:P2=P1+21:A=128:GOSUB1100:GOSUB12
   00:A=-128:GOSUB1100
70 IFX=0THEN140
80 P1=SP:P2=SP+LEN(I$)-1:GOSUB1300:IFX=0T
   HEN140
85 X1=Y:X2=E-2
90 N=Z:PRINT"{HOME}{DOWN}{CYN}";:A$=O$(N)
   :IFN=2THENA$=LEFT$(O$(2),2*NM)+"D"
100 PRINTA$:P1=SP+W:P2=P1+LEN(A$)-1:GOSUB
    1300
110 IFX=0THENGOSUB1300:GOTO110
120 ONNGOSUB1400,1500,1600,1800,2000
130 GOSUB1150:IFCL=0THENFORI=X1TOX2:POKEI
    ,PEEK(I)-128:NEXTI
135 CL=0:GOTO60
140 IFFTHEN60
145 C=1:PRINT"{BLU}";
148 FORR=1TORM:A=128:GOSUB1090:GOSUB1100:
    NEXTR
150 GOSUB1200:FORR=1TORM:A=-128:GOSUB1090
    :GOSUB1100:NEXTR
160 IFX=0THEN220
170 R=1
175 A=128:GOSUB1090:E=P2:FORI=P2TOP1STEP-
    1:IFPEEK(I)<>32THENE=I:I=P1
180 NEXTI:X=0:P=0
190 P2=E:A=128:GOSUB1100:GOSUB1200
200 P2=E:A=-128:GOSUB1100
210 IFXTHEN230
215 R=R+1:IFR<=RMTHEN175
220 C=C+1:IFC<=CMTHEN148
225 GOTO60
230 IFC<CM-CC+1THEN300
240 I=P1
245 IFL(C)=1THEN280
250 POKEI,PEEK(I)+128:GOSUB1200
260 POKEI,PEEK(I)-128:IFXTHEN280
270 I=I+1:IFI<=ETHEN250
275 GOTO215
280 POKESM+J,PEEK(I)+128:J=J+1:IFJ=PMTHEN
    F=1:GOTO60
290 GOTO148
300 Y=W-(J-W*INT(J/W)+1):IFE-P1>=YTHENGOS
    UB360:J=J+Y+1:IFJ>=PMTHENF=1:GOTO60
310 I=P1
315 POKESM+J,PEEK(I)+128
320 J=J+1:IFJ=PMTHENF=1:GOTO60
330 I=I+1:IFI<=ETHEN315
340 POKESM+J,160:J=J+1:IFJ=PMTHENF=1:GOTO
    60
350 GOTO148
360 FORI=0TOY:POKESM+J+I,160:NEXTI:RETURN
950 READNM,M,DE:IFM=0THEN970
960 FORI=1TOM:READA$,A$,A$,A$:NEXTI
970 READNI,I$:FORI=1TONI:READO$(I):NEXTI:
    RETURN
1000 READRM,CM,BR,BC,SC,CC:FORI=1TOCM:REA
     DL(I):NEXTI:RETURN
1010 GOSUB1000:S(1)=SC:IFCM=1THEN1020
1015 FORI=2TOCM:S(I)=S(I-1)+L(I-1)+BC:NEX
     TI
1020 PRINT"{HOME}{2 DOWN}{BLU}";:FORR=1TO
     RM:READM$:IFLEN(M$)>WTHENPRINT"{RVS}
     ERROR ROW{OFF}"R:GOTO1040
1030 PRINTM$;:IFLEN(M$)<WTHENPRINT
1040 IFBRTHENFORB=1TOBR:PRINT:NEXTB
1050 NEXTR:RETURN
1090 P1=SP+2*W+(R-1)*W+(R-1)*BR*W+S(C)-1:
     P2=P1+L(C)-1:RETURN
1100 FORI=P1TOP2:POKEI,PEEK(I)+A:NEXTI:RE
     TURN
1150 PRINT"{HOME}{DOWN}";:FORI=1 TO W:PRI
     NT" ";:NEXTI:PRINT"{HOME}";:RETURN
1200 X=0:P=0
1205 IF(PEEK(XJ)AND32)=0THEN1205
1210 IF(PEEK(XJ)AND32)=0THENX=1:P=DE
1220 P=P+1:IFP<DETHEN1210
1230 RETURN
1300 Z=0:Y=P1
1305 E=0:FORI=YTOP2:IFPEEK(I)=32THENE=I+1
     :I=P2:Z=Z+1:GOTO1320
1310 POKEI,PEEK(I)+128
1320 NEXTI:IFE=0THENE=P2+2:Z=Z+1
1330 GOSUB1200:IFXTHENRETURN
1340 FORI=YTOE-2:POKEI,PEEK(I)-128:NEXTI
1350 IFE=<P2THENY=E:GOTO1305
1360 RETURN
1400 ONZGOTO1410,1420:RETURN
1410 DE=DE-.5*DE:GOTO1430
1420 DE=DE+.5*DE
1430 GOSUB1975
1440 RESTORE:READA,A,A:LS=PEEK(63)+256*PE
```

```
     EK(64):PRINT"{CLR}{3 DOWN}"LS"DATA";
     NM","M","DE
1450 PRINT"CLR:T=1:GOTO10{HOME}":POKE198,
     3:FORI=0TO2:POKE631+I,13:NEXTI:END
1500 IFZ>NMTHENRETURN
1510 RESTORE:GOSUB950
1520 FORH=1TONM:IFH=ZTHENH=NM:GOTO1540
1530 GOSUB1000:FORK=1TORM:READA$:NEXTK
1540 NEXTH:GOSUB1975:PRINT"{CLR}{GRN}";I$
     :FORI=0TOPM-1:POKESM+I+CP,2:NEXTI
1550 GOSUB1010:GOSUB1970:CL=1:RETURN
1600 ONZGOTO1610,1700:RETURN
1610 IFM=0THENPRINT"{HOME}{DOWN}{RVS}NO M
     ESSAGES STORED.{OFF}{3 SPACES}":GOSU
     B1200:RETURN
1620 GOSUB1975
1630 GOSUB1150:A$=LEFT$(O$(2),2*M)+"D":PR
     INT"{DOWN}";A$
1640 P1=SP+W:P2=P1+LEN(A$)-1:GOSUB1300
1650 IFX=0THENGOSUB1300:GOTO1650
1655 IFZ>MTHENGOSUB1970:RETURN
1660 RESTORE:READNM,M,DE
1670 FORI=1TOM:IFI=ZTHENI=M:GOTO1680
1675 READA$,A$,A$,A$
1680 NEXTI
1685 K=INT(PM/4+.5):FORI=1TO4:READA$:PRIN
     T"{HOME}"A$:FORB=0TOK-1
1688 POKESM+B+(I-1)*K,PEEK(SP+B):NEXTB,I
1690 PRINT"{HOME}";:FORI=1TOW:PRINT" ";:N
     EXTI:PRINT"{HOME}{GRN}"I$"{CYN}":CL=
     1:GOTO1630
1700 POKES+2,15:FORI=1TO50:POKES,220:FORK
     =1TO5
1710 NEXTK:POKES,0:NEXTI:GOSUB1200:IFX=0T
     HEN1700
1720 POKES+2,0:RETURN
1800 ONZGOTO1810,1830,1870,1900:RETURN
1810 IFJ=0THENRETURN
1820 J=J-1:POKESM+J,32:F=0:RETURN
1830 X=0
1835 IFJ=0THENRETURN
1840 J=J-1:IFPEEK(SM+J)<>160THENPOKESM+J,
     32:F=0:X=1:GOTO1835
1850 IFXTHENJ=J+1:RETURN
1860 POKESM+J,32:GOTO1835
1870 X=0
1873 IFJ=0THENRETURN
1875 J=J-1
1880 FORI=1TO3:K=ASC(MID$(P$,I,1))+128:IF
     PEEK(SM+J)=KTHENX=X+1
1885 NEXTI:IFX<2THENPOKESM+J,32:F=0:GOTO1
     873
1890 J=J+1:RETURN
1900 GOSUB1150:A$="0 "+LEFT$(O$(2),2*M)+"
     D":PRINT"{DOWN}";A$
1905 P1=SP+W:P2=P1+LEN(A$)-1:GOSUB1300
1910 IFX=0THENGOSUB1300:GOTO1910
1915 Z=Z-1:IFZ>MTHENRETURN
1920 IFZTHEN1930
1925 FORI=0TOPM-1:POKESM+I,32:NEXTI:J=0:F
     =0:RETURN
1930 RESTORE:READNM,M,DE:LS=PEEK(63)+256*
     PEEK(64)
1935 FORI=1TOM:IFI=ZTHENI=M:GOTO1945
1940 READA$,A$,A$,A$
1945 NEXTI:M=M-1:GOSUB1975
1950 PRINT"{CLR}{3 DOWN}";LS;"DATA";NM;",
     ";M;",";DE
1955 FORI=1TO4:READA$:L=PEEK(63)+256*PEEK
     (64):PRINTL:NEXTI
1960 PRINT"CLR:F=";F;":";
1965 PRINT"T=1:GOTO10{HOME}":POKE198,7:FO
     RI=0TO6:POKE631+I,13:NEXTI:END
1970 FORI=0TOPM-1:POKESM+I,PEEK(828+I):NE
     XTI:J=PEEK(828+PM):RETURN
1975 FORI=0TOPM-1:POKE828+I,PEEK(SM+I):PO
     KESM+I,32:NEXTI:POKE828+PM,J:RETURN
2000 ONZGOTO2005,2070:RETURN
2005 GOSUB1975
2010 IFM=9THENGOSUB1150:PRINT"{DOWN}{RVS}
     MAXIMUM=9 MESSAGES.{OFF}":GOSUB1200:
     RETURN
2020 RESTORE:READNM,M,DE:LS=PEEK(63)+256*
     PEEK(64):L=LS
2025 IFM=0THENL=LS+10:GOTO2045
2030 READA$,A$,A$,A$:L1=PEEK(63)+256*PEEK
     (64)
2035 IFL1-L>40THENL=L+10:GOTO2045
2040 L=L1:GOTO2030
2045 M=M+1:PRINT"{CLR}{3 DOWN}";LS;"DATA"
     ;NM;",";M;",";DE
2047 K=INT(PM/4+.5):FORI=1TO4
2050 PRINTL"DATA"CHR$(34)CHR$(18);:LP=PEE
     K(209)+256*PEEK(210)+PEEK(211)
2051 FORB=0TOK:PRINT" ";:NEXTB:PRINTCHR$(
     34):CR=0:E=0:FORB=0TOK-1
2052 X=PEEK(828+B+(I-1)*K):IF(X<128)ANDCR
     =0THENPOKELP+E,210:CR=1:E=E+1
2053 POKELP+E,X+128*(X>127):IFCRTHENB=K-1
2054 E=E+1:NEXTB:IFCR=0THENPOKELP+E,210
2055 L=L+10:NEXTI:GOTO1960
2070 PRINT"{CLR}{3 DOWN}SAVE";CHR$(34)"CO
     MMUNICATIONS"CHR$(34)":CLR:GOTO10
     {HOME}"
2075 POKE198,1:POKE631,13:END
5000 DATA 3 , 0 , 100
6000 DATA5,"+- MENU CALL ERASE NEW"
6010 DATA"FASTER SLOWER D"
6020 DATA"1 2 3 4 5 6 7 8 9 D"
6030 DATA"RECALL SIGNAL D"
6040 DATA"CHAR. WORD SNT. MSG. D"
6050 DATA"MSG. PRGM. D"
7000 DATA6,4,1,1,1,1,3,3,5,7
7010 DATA"DR. IS{2 SPACES}COLD{2 SPACES}I
     NGEDS1"
7020 DATA"I{3 SPACES}AM{2 SPACES}WHEN
     {3 SPACES}AOTFR3"
7030 DATA"YOU ARE DRINK .ULHCP5"
7040 DATA"MOM EAT WANT{2 SPACES}?MYWKB7"
7050 DATA"DAD NO{2 SPACES}TIME{2 SPACES},
     VJQZX9"
7060 DATA"HOT YES SLEEP ;$02468"
8000 DATA11,4,0,1,1,1,4,5,9,1
8010 DATA"SUN. EARLY TOMORROW{2 SPACES}0"
8020 DATA"MON. LATE{2 SPACES}YESTERDAY 1"
8030 DATA"TUE. NIGHT WEEKEND{3 SPACES}2"
8040 DATA"WED. WEEK{2 SPACES}SPRING
     {4 SPACES}3"
8050 DATA"THU. MONTH SUMMER{4 SPACES}4"
8060 DATA"FRI. YEAR{2 SPACES}WINTER
     {4 SPACES}5"
8070 DATA"SAT. DAY{3 SPACES}FALL
     {6 SPACES}6"
8080 DATA"A.M. TIME{2 SPACES}MORNING
     {3 SPACES}7"
8090 DATA"P.M. NOON{2 SPACES}AFTERNOON 8"
8100 DATA"NOW{2 SPACES}DATE{2 SPACES}EVEN
     ING{3 SPACES}9"
8110 DATA"HOUR NEXT{2 SPACES}MIDNIGHT
     {2 SPACES}:"
9000 DATA9,3,0,1,2,0,5,7,6
9010 DATA" FISH{2 SPACES}LETTUCE SOUP"
```

```
9020 DATA" PORK{2 SPACES}CARROT{2 SPACES}
     BREAD"
9030 DATA" LAMB{2 SPACES}CELERY{2 SPACES}
     BUTTER"
9040 DATA" HT DG TOMATO{2 SPACES}CHEESE"
9050 DATA" HM BG CORN{4 SPACES}SALAD"
9060 DATA" LIVER POTATO{2 SPACES}DRESSG"
9070 DATA" STEAK FRIES{3 SPACES}CHIPS"
9080 DATA" CHKN{2 SPACES}SPINACH MUFFIN"
9090 DATA" TRKY{2 SPACES}PEAS{4 SPACES}GR
     AVY"                                  ©
```


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Larry Isaacs

The STATUS Variable

Part 2

In this conclusion of the two-part article on the STATUS variable, we examine possible ST bit values and the resulting indicators.

Before we continue our investigation of the STATUS variable (ST), let's briefly review what we discussed in Part 1.

ST is a *reserved* variable (which means that, like TI for TIME, we can't use ST as a variable in our programs) whose value indicates if anything unusual happened during the last I/O (Input/Output) operation. This status value signals a number of different conditions, using a separate bit "on" for each. However, last month we avoided a direct discussion of bits. Instead, we decided to dissect the ST value by representing the value as a sum of the numbers in the group 1, 2, 4, 8, 16, 32, 64, and -128. If you allow each number to be used only once, only one combination of these numbers can represent the value returned by ST. For example, -118 can be represented by the sum -128+8+2.

Last month we began investigating what the ST variable tells us with respect to the Datassette unit, specifically by examining the End-Of-File (EOF) indicator. The EOF condition is indicated by the presence of 64 in the sum equivalent to the ST value. After a sequence of simple test programs, we discovered that the End-Of-File indicator really meant that the next byte in the file has a value of 0. If perhaps some 0 bytes got mixed into your data, the EOF indicator would sometimes be on when reading the data.

We also found that data is written to the cassette in blocks of 191 bytes, and that a 0 byte is added automatically to the end of the data when the file is closed. Chances are very good, however, that the last block written to the file will contain something less than 191 bytes. One of the tests performed last month showed that if you accidentally read past the end of the data, you could continue receiving data with no apparent ill effects, except that the data isn't valid. We even found that you could continue reading right into an End-Of-Tape block which could follow the data file.

Testing With INPUT#

It is obviously essential, then, to pay attention to the EOF indicator and not allow any 0 bytes to be written to the data file. All the tests in last month's column used the GET# statement to read the data. Before leaving our discussion of the EOF indicator, we should see if there are any problems when using the INPUT# statement. Essentially, we need to find out how the INPUT# statement reacts to the presence of 0 bytes, and what EOF conditions they cause. Run this simple program:

```
100 OPEN 1,1,2,"TEST"
110 PRINT#1,"A";CHR$(0);"B"
120 PRINT#1,"C":CLOSE 1
200 PRINT "REWIND THE CASSETTE."
210 PRINT "PRESS RETURN WHEN READY."
220 INPUT Z$
300 OPEN 1,1,0,"TEST"
310 INPUT#1,Z$:PRINT Z$,LEN(Z$),ST
320 INPUT#1,Z$:PRINT Z$,LEN(Z$),ST
330 CLOSE 1
```

As you can see, lines 100-110 write two lines to a file, lines 200-220 ask you to rewind the cassette, and lines 300-330 read the file. Running this program results in the following display:

```
A     1     64
C     1     64
```

Something a little strange happened. The second string read began with the letter C, which implies that the B was previously read as part of the first string – yet it does not appear as part of

the first string. Also, an EOF indicator was given with the first string even though the 0 byte occurred in the middle of the string.

The missing B is fairly easy to explain. The INPUT# statement first reads its data into an input buffer. When the statement stores the data into a string variable, the data must be moved to another area of memory where string characters are stored. In this process, a 0 byte is used to mark the end of the string data to be moved. The presence of the 0 byte in the middle of the data being moved causes the process to be terminated prematurely. Thus the B is left in the input buffer, but isn't stored as part of the string.

As for the EOF, once it is set, it will remain set even though additional bytes are read as part of the input. This also illustrates another case where the EOF indicator does not halt the input of data. This means you must make sure the last data written is properly terminated if you intend to read that data with an INPUT# statement. In our program above, the PRINT# statement causes a carriage return to be written after the C. With this carriage return as the terminator, we get a valid EOF condition when reading the last of the data.

Block Length Errors

A SHORT BLOCK is indicated by the presence of the number 4 in the sum equivalent to the ST value. A LONG BLOCK is indicated by the presence of the number 8 in the sum. These status indicators mean that a block has been read from cassette which contains something other than the expected 191 bytes. This naturally indicates an error: the data read from this block is probably not what we want. These errors occur if something goes wrong while LOADing the cassette, or if something went wrong while SAVEing to the cassette.

Another way to receive these error indicators is to read a program file as if it were a data file. A program file, written by the SAVE command, differs from a data file in that the program is written as a single block. Actually two copies of the program are written (that is, two blocks), with the second copy being used to check for errors in the first block. It is highly unlikely that a program would contain exactly 191 bytes, so you will probably get an error if you try to read a program file as data. For example:

```
100 SAVE "TEST"
200 PRINT "REWIND THE CASSETTE."
210 PRINT "PRESS RETURN WHEN READY."
220 INPUT Z$
300 OPEN 1,1,0,"TEST"
310 GET#1,Z$:PRINT LEN(Z$),ST
320 CLOSE 1
```

The result displayed is:

```
1       4
```

The 4 printed for ST shows that our test program is less than 191 bytes long. You might also note that Z$ still received a byte of data although there was an error when the block was read from the cassette. We can try to force a LONG BLOCK error by adding the following two lines to the example above:

```
110 REM MAKE THE PROGRAM LONGER
120 REM MAKE THE PROGRAM LONGER
```

These lines make the program slightly longer than 191 bytes. Running the program now displays:

```
1       32
```

This wasn't quite what we were expecting. The 32 for ST indicates a CHECKSUM ERROR. With each 191-byte block written, a sum of all the bytes in the block is written along with the data. This sum, called the CHECKSUM, is used to help make sure the data is later read correctly. If at least 191 bytes are received for the block, the CHECKSUM is checked first. Even if the CHECKSUM accidentally matched, we would still get a LONG BLOCK error.

End-Of-Tape Condition

EOT is indicated by a -128 in the sum equivalent to the ST value. The program below provides a simple demonstration:

```
100 OPEN 1,1,2,"TEST"
110 PRINT#1,"A":CLOSE 1
200 PRINT "REWIND THE CASSETTE."
210 PRINT "PRESS RETURN WHEN READY."
220 INPUT Z$
300 OPEN 1,1,0,"NOFILE"
310 PRINT ST:CLOSE 1
```

However, when we RUN this program, the result isn't at all what we expected. We never get a chance to look for a value of -128 in the ST variable because the program quits with the message ?DEVICE NOT PRESENT ERROR IN 300. Later in this article we'll see that when using the serial bus, a -128 for ST indicates that an attempt was made to send data to a device not connected to the computer. When BASIC detects a -128 in the ST value while a file is open for reading, it aborts the program with the "device not present" message without checking to see if the device was the Datassette (in which case the -128 was due to an EOT marker being detected) or a serial bus peripheral such as a disk drive or modem (in which case the -128 indicates a true "device not present" condition). Since the error message throws us out of our program, there's no way to check for the EOT indicator while reading a cassette file in

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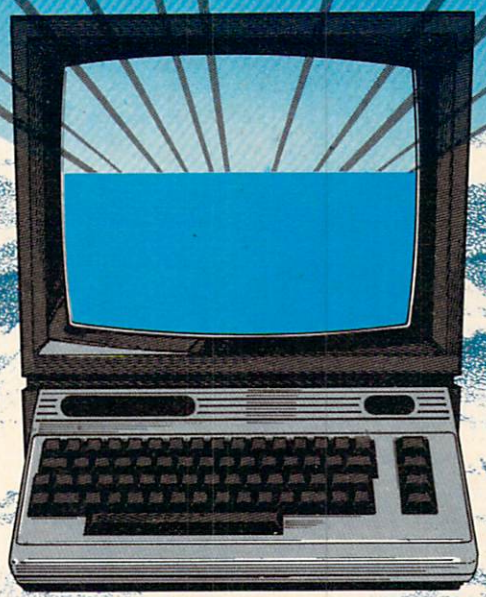

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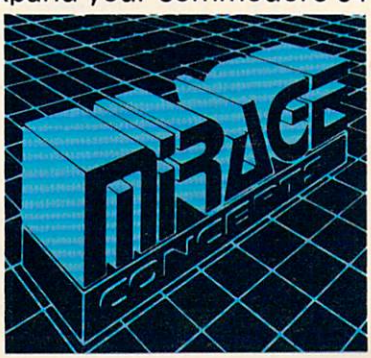

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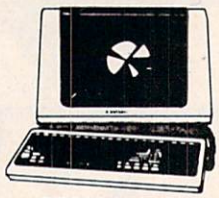

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BASIC. We'll just have to be careful not to attempt to read past the last file on the tape.

While BASIC won't let us check for the EOT marker, it doesn't place the same restrictions on itself. BASIC checks the ST variable for a -128 while LOADing or VERIFYing from cassette to determine if it has read the last program from a tape.

There's one remaining possible condition for the ST variable in cassette operations. A value of 16 in the sum indicates an UNRECOVERABLE READ ERROR. This means that a byte could not be read from the tape. However, as with the LONG BLOCK error, it is unlikely that you will detect this condition since the bad byte will also cause a CHECKSUM error, which is what the ST variable will report. As with the EOT indicator, this is a value which BASIC uses for its own testing during LOADs and VERIFYs.

We said earlier that when you SAVE a program to tape, two copies of the program are actually written out. When the program is read back in, BASIC checks for a value of 16 in the ST variable as the first copy is being read. If too many bad bytes are found, BASIC uses the second copy of the program. It is this feature which makes Commodore Datassettes such reliable data storage devices. People who have used tape storage for other home computers may have trouble believing how rarely the ?LOAD ERROR message is seen on the 64.

In our discussion of the ST variable as it relates to the cassette unit, we found several cases where its actual operation wasn't quite what we were told in the documentation (which didn't say very much on the ST variable anyway). This information will prove useful should you try to write your own program using the cassette for data storage. Also, when information provided by books or manuals isn't sufficient to deal with your specific questions or difficulties, using small test programs is often the best way to find out how something really works.

The Serial Bus

The serial bus is involved when connecting various devices, such as the 1541 disk drive, to the 64. Let's take a look at what the ST variable tells us when used with the serial bus. According to the *Commodore 64 Programmer's Reference Guide*, the status indicators are as follows:

VALUE	MEANING
1	READ TIME OUT
2	WRITE TIME OUT
4	not defined
8	not defined
16	not defined
32	not defined
64	EOI
-128	DEVICE NOT PRESENT

We'll begin with the EOI indicator, which, like EOF for the cassette, indicates when the end of the data has been reached when reading. Again, the important question is whether the EOI indicator accompanies the last byte of data, or comes on when you try to read past the last byte. A simple test program would show that the EOI indicator accompanies the last byte of data, like the EOF does with the cassette. However, a little more investigation shows that the 1541 disk drive, unlike the Datassette, is able to really know when the last byte is sent. This means your data can have all the 0 bytes you want without causing multiple EOI indications.

This also implies that the disk does something different from the cassette with respect to reading past the end of the data. A simple test here shows that the EOI indicator remains on as you continue to read past the end of the data. In addition, the READ TIME OUT indicator comes on (that is, the ST value is 66, the sum of 64+2). Thus, for any given read operation, a read routine is able to determine if the operation occurred normally, read the last byte, or has already passed the end of the data. This is a substantial improvement over what the ST variable tells us when we're working with the tape unit.

The DEVICE NOT PRESENT Indicator

The DEVICE NOT PRESENT condition is shown by the presence of -128 in the sum equivalent to the ST value. This indicator shows that an attempted communication with a particular device was not successful. The error is obvious if the selected device is not connected or not turned on. In addition, if you try to write to an existing file or read a nonexistent file on the 1541, you will get this error message.

It is important to remember that this condition can't occur until an attempt is made to transfer data. A statement like OPEN 1,13 doesn't transfer any data, so the status bit doesn't get a chance to get set. Should you execute such a statement in a program and later execute a PRINT#1 statement, the ST variable would return a value of -128, as you would expect. If you execute a GET#1 or INPUT#1 instead and have no devices connected to the serial bus, you will also get -128 for ST.

However, if at least one device is connected, then the 64 will hang up if you do an INPUT# or GET# from the nonexistent device. The only way to recover is to press the STOP and RESTORE keys simultaneously. The 64 can tell when the desired device isn't there to receive data, but not when the device isn't there to send data. The 64 will patiently wait forever if you let it. This doesn't happen, however, when no serial devices are connected or turned on. The 64 must always out-

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put some command bytes to identify the device with which it wants to communicate. With no devices to receive the command bytes, the DEVICE NOT PRESENT condition is detected before the computer begins waiting to receive data from the nonexistent device.

Since writing to a nonexistent device either hangs up the 64 or gives a DEVICE NOT PRESENT error, it leaves me wondering what situations cause the WRITE TIME OUT. We have already seen the READ TIME OUT, but that was in conjunction with the EOI indicator. Again, there isn't much in the user's manual or reference guide on this topic. I assume that these manuals indicate a data transfer operation was unsuccessful or failed to occur within some time limit.

What we've seen here for status indicators on the 64 may not be typical for other computers. You will find that the EOF indicators will typically come on after the last byte is read, rather than in conjunction with the last byte. So if you are using another computer in addition to the 64, be prepared to find some differences with respect to status indicators for I/O operations. ©

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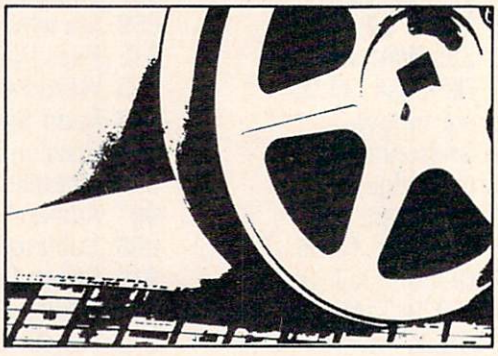

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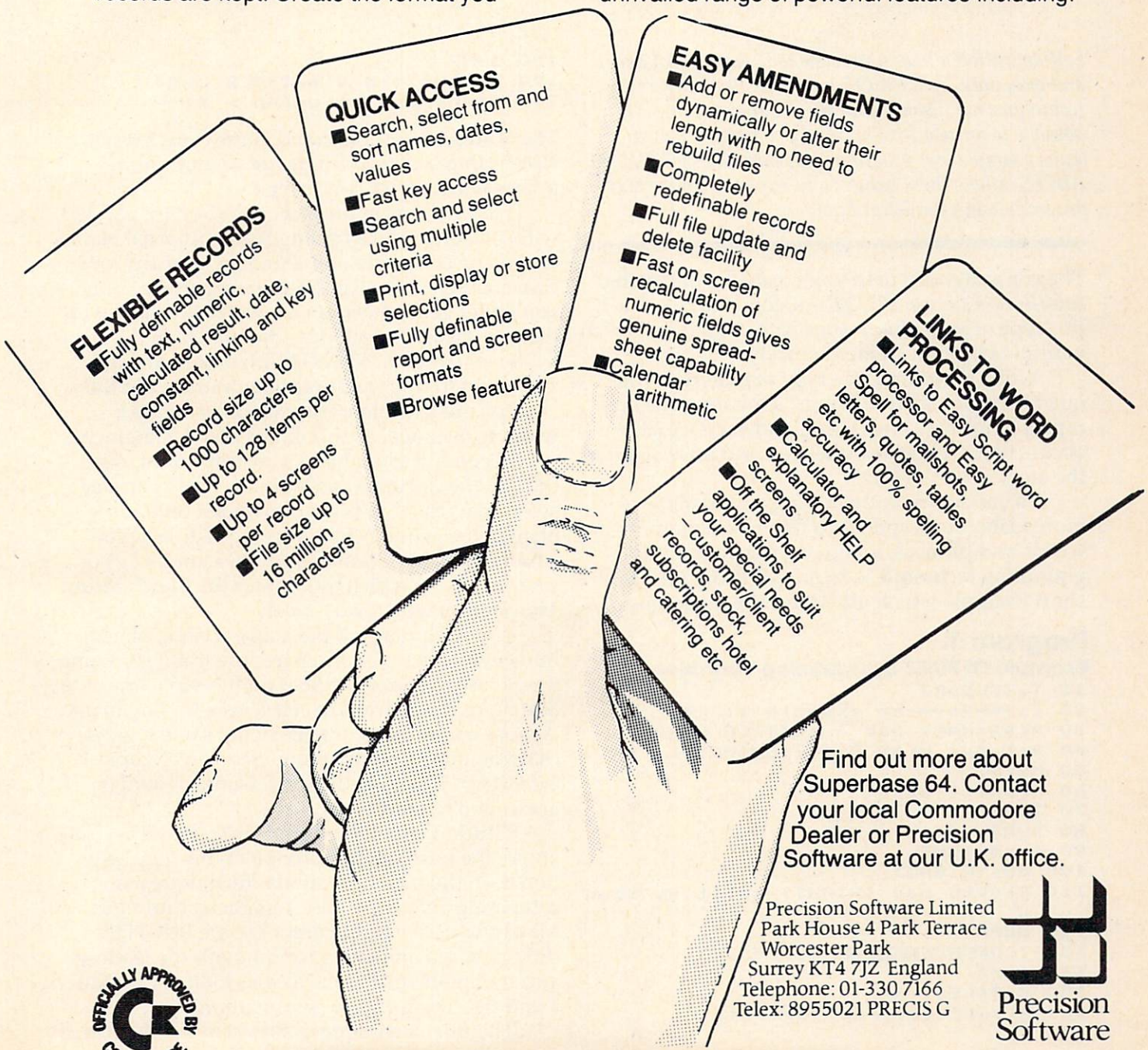

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Automatic Variables For Atari PILOT

Marvin Roberts

Self-definition allows a variable to be mentioned once, and only once, in a PILOT program. By using a few techniques not discussed in the documentation, it is possible to write a PILOT "story compiler" which: scans a simple text program; asks for values for $VARIABLES; stores these values; and runs the simple text program using the defined values.

The computer can help you create a game using *substitution stories*. PILOT is a good language for this type of interaction, especially for stories which younger children create themselves.

While preparing this type of material, you quickly recognize two things: similar words are repeated in story after story, and each variable occurs twice, once in a question and once again in the story.

To cut down on the typing and to allow a more elaborate response to the more common words and phrases, some sort of general programming technique is required. Program 1 is a short example which illustrates the technique.

Program 1:

Example Of PILOT Self-defining Variables

```
10 T:{CLEAR}
20 T:========== example #1 ===
30 A:$A=MARY had a $LITTLE LAMB
40 R:later READ D:$FILENAME,$F
50 MS:$,
60 R:split at $
70 T:
80 DUMP
90 A:=$RIGHT
100 MS:{RIGHT} ,
110 R:skip pad {RIGHT} split at blan
    k
120 DUMP
130 T:please enter $LEFT > \
140 A:$A
150 C:$$LEFT=$A
160 R:self-defined variable
170 T:
180 DUMP
190 T:MARY had a $LITTLE LAMB
200 T:=== end of example #1 ===\
```

The Match String command allows you to split strings into sections. There are several subtle points which need to be noted.

First, strings in the Accept buffer are padded with a leading and a trailing blank, internal blanks are collapsed to only one character, and any lowercase characters are switched to uppercase. You will never get a match on a lowercase string even though it is not rejected by the Match and Match String statements. $VARIABLE names are also restricted to uppercase alphanumerics, but the Accept and Calculate commands generate a warning message, as should the Match statements.

Second, trailing blanks are important. Although the documentation states that an underscore character (_) is used to match on trailing blanks, the actual behavior is more direct. You simply include a blank before the comma (,) or vertical bar (|) which terminates the Match String. This feature works very nicely.

A consequence of the active trailing blanks, however, is that you must use the trailing comma if you have a comment field on the same line as a Match, or if you want to select on a trailing blank. A more subtle consequence of the same logic is that you must avoid comments on an Accept: $VARIABLE line, as the extra blanks would be appended to your entry.

Third, if you use a cursor right (RIGHT) string entry, the leading character positions may be ignored on the match. A similar technique, concatenating an escape (ESC) character and then Matching with a right cursor escape (RIGHT) (ESC), would allow you to trim both the leading and trailing blanks. Take a close look at Program 1 and try various other combinations.

The final technique in Program 1 is the use of

an indirect reference to bootstrap a $VARIABLE. This technique, in "TALES Composer" (Program 2), will allow us to read "MARY" (Program 3) as if it were data, pick off and define the variables, and then auto-load and run with the self-defined variables.

Integrating The Programs

The entire body of the text program, MARY (Program 3), is very simple. The only distinction is that any word eligible for substitution must have a leading $ and be in uppercase.

The last three lines of Program 3 are special:

```
100 T:   the end\     (or more\)
110 A:
120 LOAD D:TALES
```

When the user finishes reading the story and presses RETURN, the LOAD statement leaves all strings intact, and the called program runs immediately.

In the composer program, TALES (Program 2), the variables are cleared and the screen is cleared. This takes the housekeeping responsibility away from Program 3.

```
10 VNEW:
20 GR:QUIT
```

A title page is displayed, and the user is asked to enter a $FILENAME, for example, MARY. The program then remains active until a keystroke is detected. This important technique is used again in each of the user modules.

```
240 *FLASH
    (overwrites in inverse video)

280 J(@B764=255):*FLASH
290 A:$FILENAME
```

Now for the magic part. It is possible to read the MARY program as if it were data. The records are placed in $F, which is then examined for $VARIABLES. When an end of file is detected, the TALES program forces the designated text program to load and run. This time, however, the $VARIABLES have been defined, and the substitutions will be made.

```
330 *NEXTOLD READ:$FILENAME,$F
340 J(@B228=136):*ENDOLD
```

One of the stated program objectives was to allow an elaborate response to certain common words and phrases. This is achieved by matching against several keywords and jumping to the appropriate user-developed module.

```
450 M:NOUN,ADJECTIVE,
460 JM:*NOUN,*ADJECTIVE,
470 J:*MODEL
480 *RETURN A:$A
```

By following the pattern provided by *MODEL and by using *RETURN as an exit when a keystroke is detected, you can add many special modules to the composer program.

Program 2: TALES Composer

```
10 VNEW:{5 SPACES}[ needed for autor
   eload
20 GR:QUIT
30 C:@B752=1{9 SPACES}[ cursor off
40 T:{CLEAR}{7 SPACES}The Teller of
   Tales
50 T:
60 T: This program will scan other P
   ILOT programs on disk and will as
   k you to provide values for all $
   VARIABLES.
70 T:Your text programs can be very
   simple as they only need T: state
   ments.
80 T:
90 T: 30 T:Mary had a $ADJECTIVE $NO
   UN.
100 T:
110 T:The Teller of Tales will be re
    loaded if the last few lines of
    the text program are:
120 T:
130 T: 100 T:{5 SPACES}more\ or th
    e end\{3 SPACES}\
140 T:
150 T: 110 A:{5 SPACES}( when ready
    )
160 T: 120 LOAD D:TALES
170 T:
180 T:=====================*=========
    ======
190 T:
200 T:
240 *FLASH POS:6,19  [ overprint
250 , T:text old FILENAME > \
260 , POS:6,19
270 , T:text old FILENAME > \
280 J(@B764=255):*FLASH  [ keystroke
290 A:$FILENAME
300 M:D:,{4 SPACES}[ add D: if neede
    d
310 , CN:$FILENAME=D:$FILENAME
320 GR:CLEAR
330 *NEXTOLD READ:$FILENAME,$F
340 J(@B228=136):*ENDOLD
350 *PARSE A:=$F
360 , MS:$,{10 SPACES}[ find variable
    s
370 JN:*NEXTOLD
380 *STRIP A:=$RIGHT
390 , MS:{RIGHT} ,{9 SPACES}[ skip l
    eft pad
400 , C:$F=$RIGHT{4 SPACES}[ split a
    t blank
410 , A:=$LEFT
420 , MS:!.!,!"!)!)!<!>!
430 ,{3 SPACES}CY:$RIGHT=$LEFT $MATC
    H$RIGHT$F
440 JY:*STRIP{8 SPACES}[ find illega
    l
450 , M:NOUN,ADJECTIVE, [ future
460 , JM:*NOUN,*ADJECTIVE, [ modules
470 , J:*MODEL{10 SPACES}[ no match
480 , R:jump back to read user entry
490 *RETURN A:$A
```

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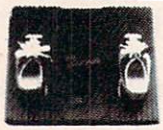
Arcade Isle



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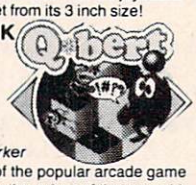

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by Ozark Softcape from Electron Arts

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To start in machine or assembly language, you need an assembler and most people start with the Atari ***ASSEMBLER/EDITOR CARTRIDGE*** (#14308 $56.95). But its operating manual assumes that you already know assembly language. ***THE ATARI ASSEMBLER BOOK*** (#11002 $14.95) by Don and Kurt Inman will guide you through the rudiments in clear, easy steps.

As you become more interested in using assembly language, ***6502 ASSEMBLY LANGUAGE SUBROUTINES*** (#18605 $17.95) is ideal. From Osborne/McGraw-Hill, Lance Leventhal describes general 6502 programming methods and provides code for more than 40 subroutines which you can learn from and use. This book is excellent for those who learn best by examples.

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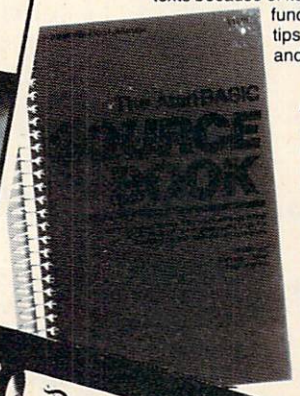

ATARI GRAPHIC MAGIC

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COMPUTE!'S FIRST BOOK OF ATARI GRAPHICS (#23746 $12.95) has games, tutorials, programs and more collected together for the first time. You'll enjoy the many how-to articles and learn the graphic tricks of many of the leading authors.

ATARI SOUND AND GRAPHICS (#20125 $10.95) published by John Wiley is an excellent self-teaching guide for those learning BASIC. You'll compose and play melodies, draw cartoons, create sound effects and simple games while learning BASIC. A perfect gift for your favorite Atari user!

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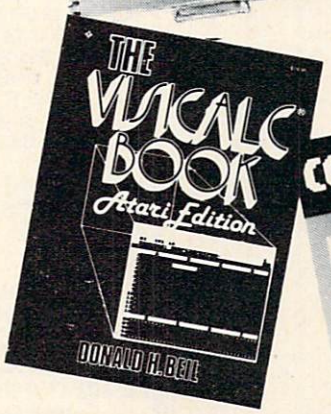
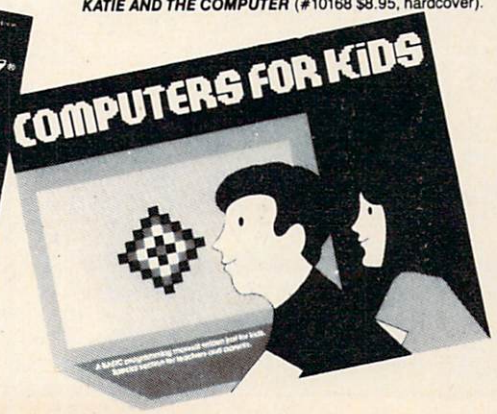
COMPUTER KIDS

For holiday gifts for the kids, you won't want to pass up ***KIDS AND THE ATARI*** (#32050 $19.95) for the 10 to 14 year old who wants to become a computer wizard.

The younger kids will like Creative's new edition of ***COMPUTERS FOR KIDS, ATARI VERSION*** (#10179 $5.95). This BASIC programming manual includes the sure-to-please program, "Scare Mom with an Elephant." Detailed instructions and sketches plus a glossary of statements and commands, lesson plans, and tips for parents all included.

For the preschoolers, we suggest ***COMPUTER PARADE*** by D'Ignazio and richly illustrated by Gilliam ($9.95, hardcover). Katie and her brother arrive in Cybernia just in time to learn how music is made from Colonel Byte. This is the second in the extremely popular series of ***KATIE AND THE COMPUTER*** (#10168 $8.95, hardcover).





THE PROGRAM STORE®

```
500 , C:$$LEFT=$A
510 , R:auto-define the text variabl
    e
520 J:*PARSE
530 *ENDOLD GR:QUIT
540 T:{CLEAR}\
550 LOAD:$FILENAME
560 E:
570 *NOUN R:dummy module
580 *ADJECTIVE R:module
590 *MODEL GR:CLEAR
600 T:{CLEAR}
610 T:this could be a special titl
    {7 SPACES}
620 T:enter $LEFT > \
630 *FMODEL GR:PEN YELLOW
640 , GR(#D<90):PEN RED
650 , GR(#D<40):PEN BLUE
660 , C:#D=?\120
670 , SO:#D
680 , GR:GOTO #D-90,?\40-15;TURNTO 4
    5
690 , GR:4(DRAW40;TURN90)
700 J(@B764=255):*FMODEL  [ keystrok
    e
710 SO:0
720 J:*RETURN
```

Program 3: MARY Text Program

```
10 R: D:MARY{3 SPACES}old text PILOT
    program
20 T:{CLEAR}
30 T:$MARY HAD A $LITTLE $LAMB
40 T:
50 T:$MARY had a $LITTLE $LAMB.
60 T:It's $FLEECE was $WHITE as $SNO
   W.
70 T:And everywhere that $MARY went,
80 T:The $LAMB was sure to $GO.
90 T:
100 T:{9 SPACES} the end\
110 A:
120 LOAD D:TALES
130 E:                              ©
```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THE COMMODORE CHARACTER SET

Dan Carmichael, Assistant Editor

The character chart on the following pages contains all the character information you will need while programming your VIC-20 or your Commodore 64. Keep it by your computer for handy reference.

Here's a handy and essential chart, including information on decimal, hexadecimal, BASIC, 6502, ASCII, and screen POKE codes. Please note the following conventions:

BASIC – lists the BASIC (language) keyword tokens.

6502 – contains the numeric representation of the 6502 instruction set. Zero page operations are listed with ZZ. Immediate operations are listed with II. Others are listed with NNNN.

ASCII – contains the Commodore ASCII control and character codes.

Screen Display – lists the character codes for POKEing to the screen. Set 1 and Set 2 correspond to uppercase and lowercase, respectively. Both sets cannot be displayed on the screen at the same time. Switch to Set 2 by simultaneously holding down the SHIFT and COMMODORE keys or POKEing 53272,23. To return to uppercase again, press the SHIFT/COMMODORE keys or POKE 53272,21.

Screen display characters may also be displayed in reverse character mode by adding 128 to the values that are listed.

Standard ASCII – gives values for standard ASCII codes. These codes can be used for controlling printers or when standard ASCII values are needed, as in telecommunications applications.

STANDARD ASCII

1	start of heading
2	start of text
3	end of text
4	end of transmission
5	enquiry
6	acknowledge
7	bell
8	backspace
9	horizontal tabulation
10	line feed
11	vertical tabulation
12	form feed
13	carriage return
14	shift out
15	shift in
16	data link escape
17	device control 1 (X-on)
18	device control 2
19	device control 3 (X-off)
20	device control 4
21	negative acknowledge
22	synchronous idle
23	end of transmission block
24	cancel
25	end of medium
26	substitute
27	escape
28	file separator
29	group separator
30	record separator
31	unit operator

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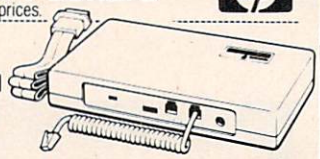

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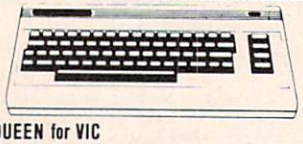

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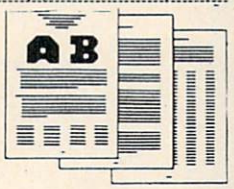

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DEC	HEX	BASIC	6502	ASCII	SCREEN DISPLAY SET 1	SET 2
0	0	END LINE	BRK		@	
1	1		ORA ($ZZ,X)		A	a
2	2				B	b
3	3				C	c
4	4				D	d
5	5		ORA $ZZ	white	E	e
6	6		ASL $ZZ		F	f
7	7				G	g
8	8		PHP	disables shft/Cmdr	H	h
9	9		ORA #$II	enables shft/Cmdr	I	i
10	A		ASL		J	j
11	B				K	k
12	C				L	l
13	D		ORA $NNNN	return	M	m
14	E		ASL $NNNN	lowercase	N	n
15	F				O	o
16	10		BPL $NNNN		P	p
17	11		ORA ($ZZ),Y	crsr down	Q	q
18	12			reverse on	R	r
19	13			clr/home	S	s
20	14			inst/del	T	t
21	15		ORA $ZZ,X		U	u
22	16		ASL $ZZ,X		V	v
23	17				W	w
24	18		CLC		X	x
25	19		ORA $NNNN,Y		Y	y
26	1A				Z	z
27	1B				[	
28	1C			red	£	
29	1D		ORA $NNNN,X	crsr right	]	
30	1E		ASL $NNNN,X	green	↑	
31	1F			blue	←	
32	20	SPACE	JSR $NNNN	space	space	
33	21	!	AND ($ZZ,X)	!	!	
34	22	"		"	"	
35	23	#		#	#	
36	24	$	BIT $ZZ	$	$	
37	25	%	AND $ZZ	%	%	
38	26	&	ROL $ZZ	&	&	
39	27	'		'	'	
40	28	(	PLP	(	(	
41	29	)	AND #$II	)	)	
42	2A	*	ROL	*	*	
43	2B	+		+	+	
44	2C	,	BIT $NNNN	,	,	
45	2D	-	AND $NNNN	-	-	
46	2E	.	ROL $NNNN	.	.	
47	2F	/		/	/	
48	30	0	BMI $NN	0	0	
49	31	1	AND ($ZZ),Y	1	1	
50	32	2		2	2	
51	33	3		3	3	
52	34	4		4	4	
53	35	5	AND $ZZ,X	5	5	
54	36	6	ROL $ZZ,X	6	6	
55	37	7		7	7	
56	38	8	SEC	8	8	
57	39	9	AND $NNNN,Y	9	9	
58	3A	:		:	:	
59	3B	;		;	;	
60	3C	<		<	<	
61	3D	=	AND $NNNN,X	=	=	
62	3E	>	ROL $NNNN,X	>	>	
63	3F	?		?	?	
64	40	@	RTI	@		
65	41	A	EOR ($ZZ,X)	A	♠	A
66	42	B		B		B
67	43	C		C		C
68	44	D		D		D
69	45	E	EOR $ZZ	E		E
70	46	F	LSR $ZZ	F		F
71	47	G		G		G
72	48	H	PHA	H		H
73	49	I	EOR #$II	I		I
74	4A	J	LSR	J		J
75	4B	K		K		K
76	4C	L	JMP $NNNN	L		L
77	4D	M	EOR $NNNN	M		M
78	4E	N	LSR $NNNN	N		N
79	4F	O		O		O
80	50	P	BVC $NN	P		P
81	51	Q	EOR ($ZZ),Y	Q	●	Q
82	52	R		R		R
83	53	S		S	♥	S
84	54	T		T		T
85	55	U	EOR $ZZ,X	U		U
86	56	V	LSR $ZZ,X	V		V
87	57	W		W		W
88	58	X	CLI	X	♣	X
89	59	Y	EOR $ZZ,Y	Y		Y
90	5A	Z		Z	♦	Z
91	5B			[		
92	5C			£		
93	5D		EOR $NNNN,X	]		
94	5E		LSR $NNNN,X	↑	π	
95	5F			←		
96	60		RTS		space	
97	61		ADC ($ZZ),X	♠		
98	62					
99	63					
100	64					
101	65		ADC $ZZ			
102	66		ROR $ZZ			
103	67					
104	68		PLA			
105	69		ADC #$II			
106	6A		ROR			
107	6B					
108	6C		JMP ($NNNN)			
109	6D		ADC $NNNN			
110	6E		ROR $NNNN			
111	6F					
112	70		BVS $NN			
113	71		ADC ($ZZ),Y	●		
114	72					
115	73			♥		
116	74					
117	75		ADC $ZZ,X			
118	76		ROR $ZZ,X			
119	77					
120	78		SEI	♣		
121	79		ADC $NNNN,Y			
122	7A			♦		↙
123	7B					
124	7C					
125	7D		ADC $NNNN,X			
126	7E		ROR $NNNN,X	π		
127	7F					

ADDITIONAL NOTES: **SCREEN CODES:** CODES 128-255 are reversed images of CODES 0-127.

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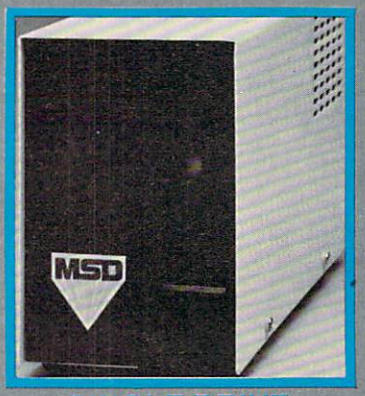

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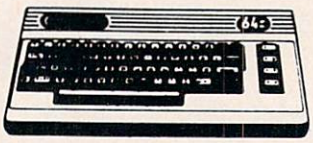

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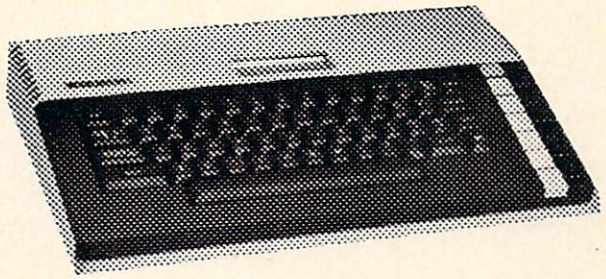

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128	80	END		
129	81	FOR	STA ($ZZ,X)	orange
130	82	NEXT		
131	83	DATA		
132	84	INPUT#	STY $ZZ	
133	85	INPUT	STA $ZZ	F1
134	86	DIM	STX $ZZ	F3
135	87	READ		F5
136	88	LET	DEY	F7
137	89	GOTO		F2
138	8A	RUN	TXA	F4
139	8B	IF		F6
140	8C	RESTORE	STY $NNNN	F8
141	8D	GOSUB	STA $NNNN	shift/carriage return
142	8E	RETURN	STX $NNNN	uppercase
143	8F	REM		
144	90	STOP	BCC $NN	black
145	91	ON	STA ($ZZ),Y	crsr up
146	92	WAIT		reverse off
147	93	LOAD		clr/home
148	94	SAVE	STY $ZZ,X	inst/del
149	95	VERIFY	STA $ZZ,X	brown
150	96	DEF	STX $ZZ,Y	lt. red
151	97	POKE		gray 1
152	98	PRINT#	TYA	gray 2
153	99	PRINT	STA $NNNN,Y	lt. green
154	9A	CONT	TXS	lt. blue
155	9B	LIST		gray 3
156	9C	CLR		purple
157	9D	CMD	STA $NNNN,X	crsr left
158	9E	SYS		yellow
159	9F	OPEN		cyan
160	A0	CLOSE	LDY #$II	space
161	A1	GET	LDA ($ZZ,X)	
162	A2	NEW	LDX #$II	
163	A3	TAB(		
164	A4	TO	LDY $ZZ	
165	A5	FN	LDA $ZZ	
166	A6	SPC(	LDX $ZZ	
167	A7	THEN		
168	A8	NOT	TAY	
169	A9	STEP	LDA #$II	
170	AA	+	TAX	
171	AB	-		
172	AC	*	LDY $NNNN	
173	AD	/	LDA $NNNN	
174	AE	↑	LDX $NNNN	
175	AF	AND		
176	B0	OR	BCS $NN	
177	B1	>	LDA ($ZZ),Y	
178	B2	=		
179	B3	<		
180	B4	SGN	LDY $ZZ,X	
181	B5	INT	LDA $ZZ,X	
182	B6	ABS	LDX $ZZ,Y	
183	B7	USR		
184	B8	FRE	CLV	
185	B9	POS	LDA $NNNN,Y	
186	BA	SQR	TSX	
187	BB	RND		
188	BC	LOG	LDY $NNNN,X	
189	BD	EXP	LDA $NNNN,X	
190	BE	COS	LDX $NNNN,Y	
191	BF	SIN		
192	C0	TAN	CPY #$II	
193	C1	ATN	CMP (ZZ,X)	
194	C2	PEEK		
195	C3	LEN		
196	C4	STR$	CPY $ZZ	
197	C5	VAL	CMP $ZZ	
198	C6	ASC	DEC $ZZ	
199	C7	CHR$		
200	C8	LEFT$	INY	
201	C9	RIGHT$	CMP #$II	
202	CA	MID$	DEX	
203	CB	GO		
204	CC		CPY $NNNN	
205	CD		CMP $NNNN	
206	CE		DEC $NNNN	
207	CF			
208	D0		BNE $NN	
209	D1		CMP ($ZZ),Y	
210	D2			
211	D3			
212	D4			
213	D5		CMP $ZZ,X	
214	D6		DEC $ZZ,X	
215	D7			
216	D8		CLD	
217	D9		CMP $NNNN,Y	
218	DA			
219	DB			
220	DC			
221	DD		CMP $NNNN,X	
222	DE		DEC $NNNN,X	
223	DF			
224	E0		CPX #$II	
225	E1		SBC ($ZZ,X)	
226	E2			
227	E3			
228	E4		CPX $ZZ	
229	E5		SBC $ZZ	
230	E6		INC $ZZ	
231	E7			
232	E8		INX	
233	E9		SBC #$II	
234	EA		NOP	
235	EB			
236	EC		CPX $NNNN	
237	ED		SBC $NNNN	
238	EE		INC $NNNN	
239	EF			
240	F0		BEQ $NN	
241	F1		SBC ($ZZ),Y	
242	F2			
243	F3			
244	F4			
245	F5		SBC $ZZ,X	
246	F6		INC $ZZ,X	
247	F7			
248	F8		SED	
249	F9		SBC $NNNN,Y	
250	FA			
251	FB			
252	FC			
253	FD		SBC $NNNN,X	
254	FE		INC $NNNN,X	
255	FF			

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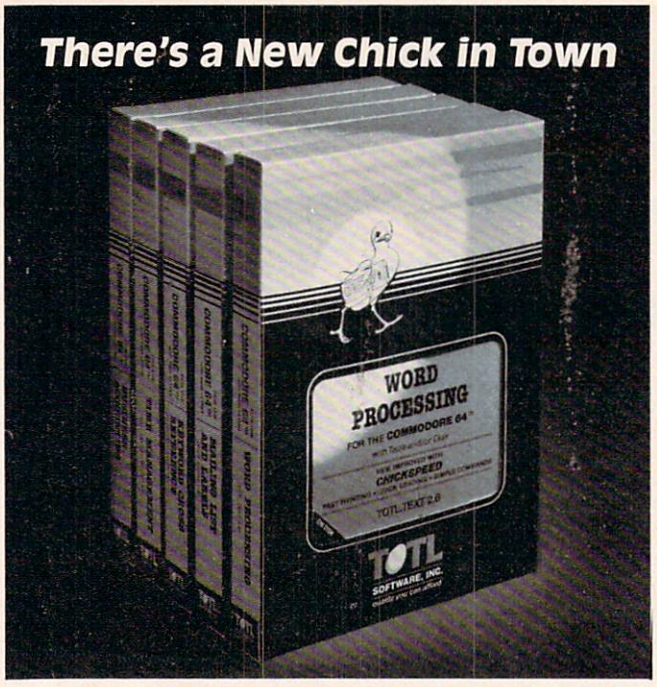

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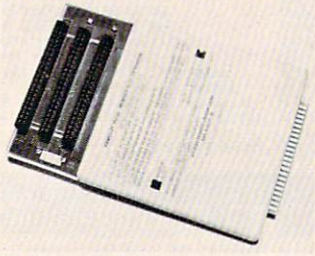

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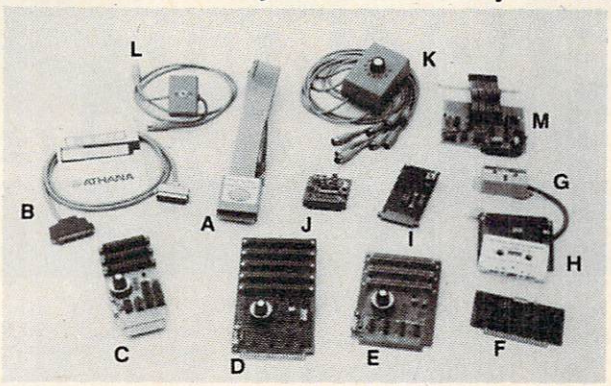

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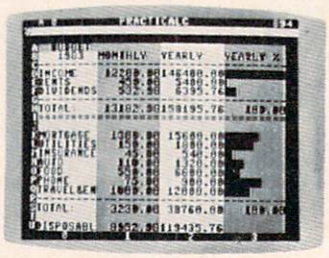

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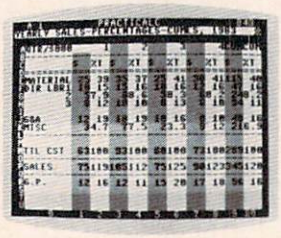

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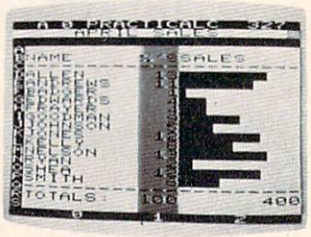

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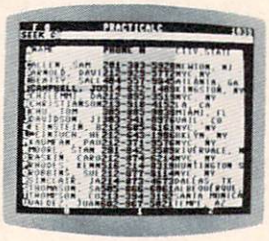

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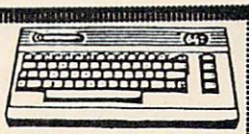

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Atari GTIA Textwriter

Matthew Ratcliff

Here is a utility that will put text on your Atari graphics screens 3-11. It was designed specifically for modes 9-11, thus the name "GTIA Textwriter." If you have tried the GTIA demos published in earlier issues of COMPUTE!, you know what superb displays can be generated in these modes.

"Textwriter" gives you 15 colors of text in mode 11, 15 shades of the same color in mode 9, and 8 different color-shade combinations in mode 10. CTIA users, don't despair; this routine will put solid-colored text on the screen in modes 3-8 as well. You can even get two-color characters in modes 3, 5, and 7. Also included is "Color Type," a fast-action typing game. But first, an explanation of Textwriter.

Until now, the only way to get text on the GTIA screens was through Display List Interrupts (DLTs) or slow PLOT, DRAWTO combinations. "Textplot" and "Textplot II" (COMPUTE!, November 1981 and December 1982) will work with a custom character set, but they limit the number of colors allowed to three. The characters will have to be generated according to Figure 1 or 2 (both for up to six colors of text – but characters will have to be duplicated). Every other column must be empty or identical to the one before to prevent the unreadable multicolored text that results when using Textplot with the standard character set. This approach might be sufficient for some needs, but I wanted something that would take full advantage of the 16 possible colors in these modes. The result is a flexible USR routine called GTIA Textwriter.

Character types for using Textplot and Textplot II in GTIA graphics modes 9-11

Figure 1

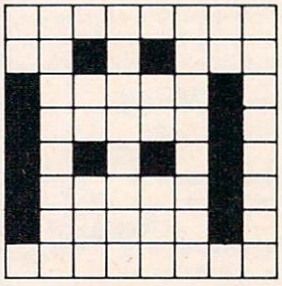
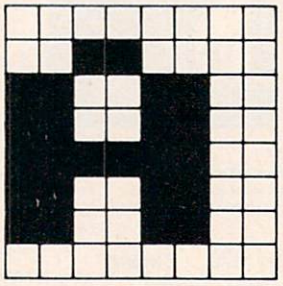


Figure 2



This program is a fully position-independent machine language routine. Using Atari's "auto return" mode, Program 1 converts the DATA statements in lines 10000 through 10400 into a series of A$ string equates (they become lines 11 through 17). When run, it will create these new program lines and stop after printing the following:

```
LPRINT
LIST "C:",10,18
```

Use the cursor control keys and RETURN to execute these two commands (LPRINT makes the tape output more reliable). This is the complete GTIA Textwriter program, all 410 bytes of it. Be sure to save the BASIC source code before trying Textwriter, in case you have to go back for a little debugging. Line 18 shows the general command format:

```
18 REM A=USR(AD,BD,COLOR,LEN(B$),ROW
   ,COL) ** AD=ADR(A$) * BD=ADR(B$)
   **
```

To check out Textwriter, try NEW, ENTER "C:" the listed code, and add the following lines:

```
20 GRAPHICS 11:COLOR 1:PLOT 0,0:DRAW
   TO 79,191:C=1
30 A=USR(AD,ADR("TEST"),C,4,90,24)
40 C=C+1:IF C>15 THEN C=1
50 GOTO 30
```

This program will draw a diagonal line across the screen and then flash "TEST" near the center of the screen. If all goes well, you are ready to proceed. If not, go back to the source and track down the problem in the DATA.

Color And Text Variations

Now that you have Textwriter running, let's learn a little about how to take advantage of some of its features. First of all, Textwriter is a very USR friendly routine. It has a flexible calling format to save time and effort in coding. If too much infor-

mation is given to Textwriter, it executes what it needs, cleans up the stack (ignoring the extra), and returns safely to BASIC. When parameters are left off, certain default conditions are set by the routine. Below is a table showing all the valid calls for Textwriter and the associated default conditions.

Valid Calls And Default Conditions

1. A=USR(AD,ADR("TEXT"),COLR,4,Y,X)
   General calling format, no defaults.
2. A=USR(AD,BD,COLR,LEN(B$),Y)
   No X, then left justified (X=0).
3. A=USR(AD,ADR("PLOT"),COLR,4)
   No Y or X, then placed at first character position following current graphics cursor position (set by PLOT DRAWTO, etc.).
4. A=USR(AD,ADR("T"),COLR)
   No X, Y, or length specified. The current graphics cursor position is defaulted and a length of 1 is used.
5. A=USR(AD,ADR("A"))
   No X, Y, length, or color. All the #4 defaults are used, and the last color set by the BASIC COLOR command is used.

The only invalid call to Textwriter is A=USR(AD). With no string address it can do little, so it will ring the console buzzer (like Textplot) and return safely to BASIC.

To get three colors of text in modes 3, 5, and 7, use colors 5, 10, and 15. Other color choices will give interesting characters with blank or colored vertical bands through them. The most interesting are colors 6 and 9, which give two-color text. These colors can be changed with SETCOLOR registers 0 and 1. The color band sequence for 6 is the complement of 9, which can be used to make the text appear animated. For example:

```
20 GRAPHICS 21:SETCOLOR 1,5,10:SETCO
   LOR 0,9,8
30 A=USR(AD,ADR("AB"),6,1):FOR J=1 T
   O 50:NEXT J
40 A=USR(AD,ADR("AB"),9,1):FOR J=1 T
   O 50:NEXT J:GOTO 30
```

Use color 15 to get solid text in modes 4, 6, and 8. In mode 8, color 5 results in blue text, and 10 in red text, through artifacting (this is seen best on a black background, GRAPHICS 8:POKE 710,0). If you have Textplot and/or Textplot II in your program library, you will be happy to know that GTIA Textwriter is quite compatible with either of them, since all of Textwriter's workspace is floating point RAM on page zero, which is free for USR routines. These routines can work together to put two different sizes of text on the same screen without having to go to DLIs.

Typing Practice Game

The Color Type game (Program 3) uses GTIA Textwriter and another USR routine. This USR routine and the game's music data will be loaded into strings with Program 2. Run Program 2, creating lines 1-9, ENTER "C:" Textwriter and then LIST "C:",1,18. This code can then be ENTERed into RAM so that you can begin typing in Program 3. The USR routine loaded with Program 2 is a clear screen utility put in CLS$. The screen will blank with random color pixels rather than the basic black you get with a GRAPHICS 11 command. The CLS$ USR routine is called after each word is typed successfully on the screen, since the word destroys part of the background as it is displayed.

Color Type is a touch-typing practice game. It has lots of colors (using GTIA graphics mode 11), sound, and two complete songs. The introductory song played with the title page should be interesting, though not perfect. The second song sounds quite nice, since it is played completely in minor chords (line numbers for DATA in lines 935 through 981 are very important). You must be a pretty good typist to get to this musical part of the game, as you will see.

Press any key to leave the title page and begin typing. Color Type restores to a random line number and reads the sentence stored there, one word or short phrase at a time. The words are put at or near the top of the screen and begin to drift toward the bottom. You must type the word correctly before it gets that far and blows you up, thus ending the game. One wrong key and you have to retype the entire word. After each sentence is typed, the difficulty factor increases and the next sentence appears a little lower on the screen.

After five complete sentences (this factor will vary as difficulty increases), your current score and words per minute (WPM) for that set of sentences (SET) will be displayed. Press the space bar to continue typing or the Q key to quit and see a summary of your typing performance, including:

1) Average WPM
2) Best WPM set
3) Total characters typed
4) Total typo errors
5) Final score

By continuing after each SET, you may reach several bonuses. Once the difficulty is increased to the point where the words originate below the center of the screen, you will get a bonus at the end of the current SET. If you type through six bonus SETs successfully, you will get an extra bonus of 1000 points and hear the second song mentioned above. At an average typing speed of 40 WPM, it takes about 15 minutes to get this far in the game – a good practice session. If you decide to continue, the game play loop will start over with the minimum difficulty. My guess is that an average typing speed of 30-35 WPM is required to ever get this far. If you are a beginner and would

like to hear the music more often, replace line 620 with the following:

```
620 DIF=2*TX:IF DIF>60 THEN TX=0:DIF
    =1:GOSUB 840
```

This will give you an extra bonus after every three bonus SETs. If you are a real pro, change the IF statement to DIF>160.

Color Type is fast enough to allow typing speeds of up to 70 WPM. It will not run any faster due to software overhead. I've gotten up to 64 WPM by practicing the same line repeatedly (only 38 WPM on the 400 membrane keyboard). Feel free to customize Program 3 by changing the DATA statements beginning at line 1000 (line increment of 1). Each sentence must begin with a number equal to the total number of words or short phrases in the sentence, followed by the word list, with commas separating the words. For example:

```
1009 DATA 3,THIS,IS A,TEST
```

Upper- and lowercase may be used in the data as well. Some punctuation may be added, like a period at the end of the sentences. Even inverse video or control characters may be used (but this might make the game just a *bit* difficult). If more data is added, the LINES equate at line 220 must be updated accordingly. Note that word length is limited to only nine characters; with more than nine, wraparound will occur.

This program is also good for memorization and spelling practice. If you need to memorize something, arrange the DATA sentences in the proper squence and add the following line:

```
201 LNO=0
```

Then replace line 250 with:

```
250 LNO=LNO+1:IF LNO>LINES THEN LNO=
    0:RESTORE 1000
```

Program 1: GTIA Textwriter

```
5 GRAPHICS 0:? "CONVERTING...11"
10 DIM A$(410),B$(25):AD=ADR(A$):BD=
   ADR(B$)
18 REM A=USR(AD,BD,COLOR,LEN(B$),ROW
   ,COL) **AD=ADR(A$) * BD=ADR(B$)**
19 NA=0:L=11:RESTORE
20 FOR I=1 TO 410
30 READ A:A$(I,I)=CHR$(A)
40 IF INT(I/60)=I/60 AND I>59 OR I=4
   10 THEN LA=NA+1:NA=I:GOSUB 700
50 NEXT I
60 ? "LPRINT":? :? :? "LIST ";CHR$(3
   4);"C:";CHR$(34);",10,18":STOP
700 T=PEEK(709):POKE 709,PEEK(710):?
    CHR$(125)
710 POSITION PEEK(82),2:? :? L;" A$(
    ";LA;",";NA;")=";CHR$(34);
715 FOR K=LA TO NA:? CHR$(27);A$(K,K
    );:NEXT K
720 ? CHR$(34)
730 ? "CONT"
740 POSITION PEEK(82),0:POKE 842,13:
    STOP
750 POKE 842,12:L=L+1:? CHR$(125);"C
    ONVERTING...";L:POKE 709,T:RETUR
    N
10000 DATA 165,200,133,223,169,1,133
      ,222,165,84
10010 DATA 133,229,165,85,133,227,16
      5,86,133,228
10020 DATA 166,87,169,10,224,5,144,8
      ,169,20
10030 DATA 224,7,144,2,169,40,133,23
      9,104,240
10040 DATA 48,170,104,133,213,104,13
      3,212,202,240
10050 DATA 49,104,104,133,223,202,24
      0,42,104,104
10060 DATA 133,222,202,240,35,104,10
      4,133,229,202
10070 DATA 240,22,104,133,228,104,13
      3,227,202,240
10080 DATA 19,104,104,202,208,251,24
      ,144,11,169
10090 DATA 253,76,164,246,169,0,133,
      227,133,228
10100 DATA 165,229,133,233,165,239,1
      33,236,169,0
10110 DATA 133,230,162,8,10,38,230,6
      ,233,144
10120 DATA 7,24,101,236,144,2,230,23
      0,202,208
10130 DATA 239,133,229,165,88,133,21
      6,165,89,133
10140 DATA 217,165,229,24,101,216,13
      3,216,165,230
10150 DATA 101,217,133,217,162,1,165
      ,87,201,9
10160 DATA 176,7,162,2,74,176,2,162,
      3,165
10170 DATA 227,101,228,240,25,70,228
      ,102,227,202
10180 DATA 240,5,70,227,202,208,251,
      230,227,24
10190 DATA 165,227,101,216,133,216,1
      44,2,230,217
10200 DATA 165,216,133,224,165,217,1
      33,225,169,0
10210 DATA 133,226,162,0,169,0,149,2
      18,232,165
10220 DATA 223,149,218,10,10,10,10,2
      32,149,218
10230 DATA 5,219,232,149,218,164,226
      ,177,212,162
10240 DATA 0,134,234,201,128,144,4,4
      1,127,198
10250 DATA 234,170,133,236,224,96,17
      6,13,169,64
10260 DATA 224,32,144,2,169,224,24,1
      01,236,133
10270 DATA 236,169,8,133,233,169,0,1
      33,215,162
10280 DATA 8,10,38,215,6,233,144,7,2
      4,101
10290 DATA 236,144,2,230,215,202,208
      ,239,133,214
10300 DATA 24,173,244,2,101,215,133,
      215,160,0
10310 DATA 132,235,160,8,132,238,24,
      144,3,24
10320 DATA 144,169,164,235,177,214,2
      30,235,69,234
10330 DATA 133,232,169,0,133,237,169
```

COMPUTE!'s First Book Of Atari Graphics

Authors: **COMPUTE!** Magazine editors and contributors
Price: $12.95
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COMPUTE!, the leading magazine of home, educational, and recreational computing, has led the way for Atari owners since the computers were first introduced in 1979. **COMPUTE!** has published scores of articles on Atari graphics, and was the first to divulge many important details on such techniques as redefined characters, custom graphics modes, and player/missile graphics. But those articles are scattered across dozens of issues, many of which are scarce or out of print.

That's why the editors of **COMPUTE!** decided to gather the very best Atari graphics articles published over the past three years into *COMPUTE!'s First Book Of Atari Graphics*. From the fundamentals to advanced techniques, here are some of the most instructive articles ever published for the Atari.

But that's not all. *COMPUTE!'s First Book Of Atari Graphics* also presents articles never before published anywhere, and additional sections written especially for this book. These include "The Basics Of Atari Graphics," an introductory tutorial which prepares beginners for the rest of the book; "How To Design Custom Graphics Modes," which covers the fundamentals of mixing modes on a single screen; and "Introduction To Player/Missile Graphics," a guide to understanding one of the Atari's most advanced features, written by Bill Wilkinson, a **COMPUTE!** columnist and a creator of Atari BASIC and the Atari Disk Operating System.

Numerous other articles include "Designing Your Own Character Sets," a new and improved "SuperFont," "High Speed Animation With Character Graphics," "Animation And Player/Missile Graphics," "The Collision Registers," and "GRAPHICS 8 In Four Colors Using Artifacts." There's even a brand new article by Wilkinson, "The Priority Registers," which for the first time shows how to use player/missile graphics to create a *fifth* player.

In the **COMPUTE!** tradition, *Atari Graphics* is crisply written and edited to be useful to beginners and experts alike. And it's spiral-bound for easy access to its dozens of ready-to-type program listings.

v. Introduction . . . . . Robert C. Lock

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```
      ,4,133,231
10340 DATA 169,0,133,233,160,2,6,232
      ,38,233
10350 DATA 136,208,249,166,233,181,2
      18,164,237,145
10360 DATA 216,230,237,198,231,208,2
      29,24,165,216
10370 DATA 101,239,133,216,144,2,230
      ,217,198,238
10380 DATA 208,196,198,222,208,1,96,
      230,226,24
10390 DATA 165,224,105,4,133,224,144
      ,2,230,225
10400 DATA 133,216,165,225,133,217,2
      4,144,166,96
```

Program 2: Music Data Loader For Color Type

```
100 DIM CLS$(33),SONG$(124),TUNE$(37
    6):GRAPHICS 0:? "WORKING ON IT..
    ."
110 RESTORE 10000
120 FOR I=1 TO 33:READ A
130 CLS$(I,I)=CHR$(A):NEXT I
140 FOR I=1 TO 124 STEP 2
150 READ C,N
160 SONG$(I,I)=CHR$(C):SONG$(I+1,I+1
    )=CHR$(N):NEXT I
200 ? CHR$(125):POSITION PEEK(82),2:
    ? :? "1 DIM CLS$(33),SONG$(124),
    TUNE$(376):CLS$=";CHR$(34);
210 FOR I=1 TO LEN(CLS$):? CHR$(27);
    CLS$(I,I);:NEXT I:? CHR$(34)
220 GOSUB 500:REM ENTER IT
230 ? CHR$(125):POSITION PEEK(82),2:
    ? :? "2 SONG$(1,62)=";CHR$(34);
240 FOR I=1 TO 62:? CHR$(27);SONG$(I
    ,I);:NEXT I:? CHR$(34)
250 GOSUB 500
260 ? CHR$(125):POSITION PEEK(82),2:
    ? "3 SONG$(63,124)=";CHR$(34);
270 FOR I=63 TO 124:? CHR$(27);SONG$
    (I,I);:NEXT I:? CHR$(34)
280 GOSUB 500
290 RESTORE 6000
300 FOR I=1 TO 376:READ C:TUNE$(I,I)
    =CHR$(C):SOUND 0,C,10,3:NEXT I
310 D=1
320 FOR I=1 TO 5:? CHR$(125):POSITIO
    N PEEK(82),2:? I+3;" TUNE$(";D;"
    ,";D+61;")=";CHR$(34);
330 FOR J=D TO D+61:? CHR$(27);TUNE$
    (J,J);:NEXT J
340 ? CHR$(34):GOSUB 500
350 D=D+62:NEXT I
360 ? CHR$(125):POSITION PEEK(82),2:
    ? "9 TUNE$(311,376)=";CHR$(34);
370 FOR I=311 TO 376:? CHR$(27);TUNE
    $(I,I);:NEXT I
380 ? CHR$(34):GOSUB 500
390 ? CHR$(125):LIST 1,9
400 ? :? "LPRINT":? :? :? "LIST ";CH
    R$(34);"C:";CHR$(34);",1,9":END
500 ? "CONT"
510 POSITION PEEK(82),0:POKE 842,13:
    STOP
520 POKE 842,12
530 RETURN
6000 DATA 5,162,5,162,5,162,5,162,10
     ,128,10,128,5,108,5,108,5,108,5
     ,108,10,96,10,81,10,121,10,121,
     10,96,5,96
6010 DATA 10,81,5,96,10,81,5,72,5,81
     ,10,96,10,81,10,96,10,81,10,96,
     10,96,5,108,10,96,5,85,30,108,2
     5,100
6020 DATA 40,100,5,162,10,162,5,162,
     5,128,5,128,5,128,5,128,10,108,
     10,108,10,96,10,81
6030 DATA 5,121,10,121,5,121,10,96,5
     ,96,10,81,5,96,10,81,5,72,5,81,
     5,81,15,64,10,72,10,81,5,108,5,
     96
6040 DATA 10,108,10,128,10,128,10,12
     8,20,162,40,100,10,96,10,81,10,
     68,15,72,30,81
6050 DATA 10,96,10,81,10,81,5,96,10,
     81,5,96,10,72,10,72,10,64,10,96
     ,10,81
6060 DATA 10,100,15,64,15,72,10,81,1
     10,96,5,96,15,81,10,81,10,81,5,
     96,10,81,15,81,10,81,10,72,10,6
     4,10,96,10,81
6070 DATA 10,100,15,68,15,72,10,81,1
     0,96,10,96,10,81,10,81,5,96,15,
     81,10,72,10,64,10,96,10,81
6080 DATA 20,72,10,72,20,72,110,72,1
     0,96,10,64,10,100,10,47,5,64,15
     ,53,10,64,10,53,10,64,20,100
6100 DATA 10,68,15,72,30,81,10,100,1
     0,96,10,81,5,96,10,81,5,96,105,
     81,10,72,10,64,10,96,10,81,10,1
     00,15,64,10,100
6110 DATA 15,72,110,81,10,96,5,96,15
     ,81,10,81,10,81,5,96,15,81,15,8
     1,10,81,10,72,10,64,10,96,10,81
6120 DATA 10,100,15,68,15,72,110,81,
     10,96,10,96,10,81,10,81,5,96,15
     ,81,10,81,10,72,10,64,10,96,10,
     81
6130 DATA 20,72,10,72,20,72,110,72,1
     0,96,10,64,10,53,10,47,5,64,15,
     53,10,64,10,53,10,64,20,100
10000 DATA 104,165,88,133,214,165,89
      ,133,215,169
10010 DATA 30,133,216,160,0,173,10,2
      10,9,17
10020 DATA 145,214,230,214,208,245,2
      30,215,198,216
10030 DATA 208,239,96
10040 DATA 15,40,5,40,5,35,5,40,5,47
10050 DATA 5,60,20,60,20,72,15,81,5,
      60
10060 DATA 5,47,5,60,5,40,5,47,40,53
10070 DATA 15,40,5,40,5,35,5,40,5,47
10080 DATA 5,60,20,60,20,72,15,81,5,
      60
10090 DATA 5,47,5,53,5,60,5,64,30,60
10100 DATA 10,100,15,53,5,57,5,53,5,
      47
10110 DATA 5,45,5,53,20,47,20,40,15,
      35
10120 DATA 5,35,5,40,5,47,5,45,5,47
10130 DATA 40,53,15,40,5,40,5,35,5,4
      0
10140 DATA 5,47,5,60,20,60,20,72,15,
      81
10150 DATA 5,60,5,47,5,53,5,60,5,64
10160 DATA 40,60,40,100
```

Program 3: Color Type

```
20 S0=53760:S1=S0+2:GOSUB 5000:GOTO
   200
30 MINUTES=(PEEK(20)+256*PEEK(19)+65
   536*PEEK(18))/3600:RETURN
```

```
40 POKE 18,0:POKE 19,0:POKE 20,0:RET
   URN
200 DIM WORD$(10),BL$(10):OPEN #1,4,
    0,"K:":RD=53770:BL$="{10 SPACES}"
    :BL=ADR(BL$):TX=0:CHARCNT=0:CLS=
    ADR(CLS$)
210 GOSUB 40
220 LINES=9:REM TOTAL # OF LINES DEF
    INED IN DATA
230 GRAPHICS 11:DIF=0:CC=1:SC=0:S0=5
    3760:TTLNS=0:TCHAR=0:TERR=0
240 TTLNS=TTLNS+1:TRAP 250:SOUND 0,0
    ,10,6
250 LNO=INT(RND(1)*LINES)+1000:RESTO
    RE LNO
260 READ WORDS:TRAP 40000
270 FOR I=1 TO WORDS:READ WORD$:LB=0
    :B$="":WW=LEN(WORD$):XP=INT((80-
    8*WW)/2)-8:XP=XP*(XP>0):CHARCNT=
    CHARCNT+WW
280 A=USR(CLS)
290 FOR Y=DIF TO 175
300 CC=CC+1:IF CC>15 THEN CC=1
310 A=USR(AD,ADR(WORD$),CC,WW,Y,XP):
    POKE S0,Y:IF (PEEK(764)=255) THE
    N 380
320 GET #1,K:LB=LB+1:B$(LB,LB)=CHR$(
    K)
330 Q=LB-1:A=USR(AD,BD+Q,CC,1,183,8*
    Q+XP)
340 ON B$=WORD$ GOTO 430
350 ON (B$(LB,LB)=WORD$(LB,LB)) GOTO
     380
360 FOR Q=15 TO 0 STEP -0.5:SOUND 0,
    200,8,Q:NEXT Q:SOUND 0,Y,10,6:PO
    KE 764,255:A=USR(AD,BL,1,LB,183,
    XP):LB=0
370 SC=SC-WW:B$="":TERR=TERR+1
380 NEXT Y
390 A=USR(AD,ADR("* CRASH *"),6,9,80
    )
400 A=175:FOR Q=15 TO 0 STEP -0.2:PL
    OT XP,A:DRAWTO 8*WW+XP+1,A:IF IN
    T(Q)=Q THEN A=A+1:COLOR Q
410 SOUND 0,PEEK(RD),8,Q:NEXT Q:SC=S
    C-WW:SOUND 0,0,0,0:POKE 764,255
420 COLOR 0:FOR Q=175 TO 191:PLOT XP
    ,Q:DRAWTO 8*WW+XP+1,Q:NEXT Q:TCH
    AR=TCHAR+CHARCNT:GOTO 740
430 SC=SC+WW:POKE S0,60
440 NEXT I:GOSUB 30
450 DIF=DIF+6:IF DIF>=143 THEN 480
470 IF TTLNS<5 THEN GOTO 240
480 TTLNS=0
490 GRAPHICS 11:B$=STR$(SC)
500 A=USR(AD,ADR("* SCORE *"),5,9,18
    ):I=INT(10-(LEN(B$)/2)+5)*8:IF I
    <0 THEN I=0
510 A=USR(AD,BD,3,LEN(B$),40,I):POKE
     764,255
520 FOR I=0 TO 74 STEP 2:COLOR INT(1
    4*RND(I))+1
530 PLOT I,0:PLOT I,190:POKE S0,PEEK
    (RD)
540 PLOT I,1:PLOT I,189:NEXT I
550 FOR I=0 TO 189 STEP 5:COLOR INT(
    RND(I)*14)+1
560 PLOT 0,I:PLOT 74,I+1:PLOT 0,I+1:
    PLOT 74,I+1:PLOT 0,I+2:PLOT 74,I
    +2
570 POKE S0,PEEK(RD):NEXT I
580 FOR I=15 TO 0 STEP -0.1:SOUND 0,
    120,12,I:NEXT I
590 IF DIF<143 THEN GOTO 650
600 A=USR(AD,ADR("BONUS"),7,5,64,16)
    :TX=TX+10:Q=100*(TX/10):SC=SC+Q:
    B$=STR$(Q)
610 A=USR(AD,BD,9,LEN(B$),80,24)
620 DIF=TX*2:IF DIF>100 THEN TX=0:DI
    F=1:GOSUB 840
630 FOR I=1 TO 50:A=240*RND(0):FOR Q
    =0 TO 15 STEP 5:SOUND 0,A,10,Q:S
    OUND 1,A+5,10,Q:NEXT Q:NEXT I
640 SOUND 0,0,0,0:SOUND 1,0,0,0
650 REM CURRENT WPM
660 POKE 764,255
670 WPM=INT((CHARCNT/5)/MINUTES):TWP
    M=TWPM+WPM:TSETS=TSETS+1:TCHAR=T
    CHAR+CHARCNT:CHARCNT=0
680 B$=STR$(WPM):IF WPM>BWPM THEN BW
    PM=WPM
690 A=USR(AD,ADR("* WPM *"),CC,7,140
    ,8):CC=CC+1:IF CC>15 THEN CC=1
700 A=USR(AD,BD,CC,LEN(B$),156,24):C
    C=CC+1:IF CC>15 THEN CC=1
710 IF PEEK(764)=255 THEN 690
720 GET #1,K:IF CHR$(K)="Q" THEN GOT
    O 740
730 GRAPHICS 11:GOSUB 40:GOTO 240
740 GRAPHICS 0:POSITION 2,2:IF TSETS
    =0 THEN TSETS=1
750 ? "AVERAGE WORDS PER MINUTE = ";
    INT(TWPM/TSETS)
760 POSITION 10,4:? "BEST WPM = ";BW
    PM
770 POSITION 2,6:? "TOTAL CHARACTERS
     TYPED = ";TCHAR
780 POSITION 6,8:? "TOTAL TYPO ERROR
    S = ";TERR:POSITION 8,10:? "FINA
    L SCORE = ";SC
790 POSITION 7,14:? "(S)TOP OR (R)EP
    LAY ";
800 SETCOLOR 2,CC,3:CC=CC+1:IF CC>15
     THEN CC=1
810 IF PEEK(764)=255 THEN 800
820 GET #1,A:IF CHR$(A)="S" THEN GRA
    PHICS 0:END
830 RUN
840 REM SONG ROUTINE TO GIVE A REST
850 S=ADR(SONG$):L=LEN(SONG$):REM TO
     THE WEARY TYPIST
860 FOR I=S TO S+L-1 STEP 2
870 C=PEEK(I):N1=PEEK(I+1):IF N1=100
     THEN 890
880 RESTORE 900+N1:READ N2,N3,N4
882 SOUND 0,N1,10,10:SOUND 1,N2,10,8
    :SOUND 2,N3,10,6:SOUND 3,N4,10,5
890 FOR DELA=1 TO 6*C:NEXT DELA:FOR
    G=0 TO 3:SOUND G,0,0,0:NEXT G:NE
    XT I
900 SC=SC+1000:A=USR(AD,ADR("1000"),
    12,4,72,24):RETURN
935 DATA 42,52,70
940 DATA 47,60,81
945 DATA 54,67,90
947 DATA 56,70,94
953 DATA 63,79,106
957 DATA 68,85,114
960 DATA 71,90,120
964 DATA 76,96,128
972 DATA 85,108,144
981 DATA 96,121,162
1000 DATA 16,NOW,IS,THE,TIME,FOR,ALL
     ,GOOD,MEN,TO,COME,TO,THE,AID,OF
     ,THEIR,COUNTRY
1001 DATA 5,MARY,HAD,A,LITTLE,LAMB
```

```
1002 DATA 4,TIRED,FINGERS,TYPE,SLOWL
     Y
1003 DATA 9,THE,RAIN,IN,SPAIN,FALLS,
     MAINLY,ON,THE,PLAIN
1004 DATA 6,TYPING,IS,GOOD,FOR,THE,F
     INGERS
1005 DATA 5,I,EAT,BANANAS,FOR,LUNCH
1006 DATA 7,TOUCH,TYPING,IS A,TRUE,T
     EST,OF,SKILL
1007 DATA 5,VIDEO,GAMES,ARE,GREAT,FU
     N
1008 DATA 6,WE,SAW A,ZEBRA,AT,THE,ZO
     O
5000 REM TITLE PAGE
5010 GRAPHICS 11
5020 B$="COLOR":CC=1:Y=24
5030 FOR I=0 TO LEN(B$)-1
5040 A=USR(AD,BD+I,CC,1,Y,8*I+16)
5050 CC=CC+1:IF Y=24 THEN Y=28:GOTO
     5070
5060 Y=24
5070 NEXT I
5080 B$="TYPE":Y=48
5090 FOR I=0 TO LEN(B$)-1
5100 A=USR(AD,BD+I,CC,1,Y,8*I+16)
5110 CC=CC+1:IF CC>15 THEN CC=1
5120 IF Y=48 THEN Y=52:GOTO 5140
5130 Y=48
5140 NEXT I
5150 A=USR(AD,ADR(" BY "),9,4,86,16)
5160 T=ADR(TUNE$):SOUND 0,0,10,8:SOU
     ND 1,0,10,6
5170 A=USR(AD,ADR("PRESS ANY"),3,9,1
     48,0):A=USR(AD,ADR("KEY"),4,3,1
     64,24):COLOR 0:PLOT 8,124
5180 FOR I=T TO T+LEN(TUNE$)-1 STEP
     2
5190 C=PEEK(I):N=PEEK(I+1):F=0
5200 IF C>100 THEN C=C-100:F=1
5210 IF N=100 THEN GOTO 5230
5220 POKE S0,N:POKE S1,N+1
5230 A=USR(AD,ADR("MAT RAT"),CC,7):C
     C=CC+1:IF CC>15 THEN CC=1
5240 FOR A=1 TO 1.2*C:NEXT A
5250 IF  NOT (F) THEN POKE S0,0:POKE
      S1,0
5260 IF PEEK(764)<>255 THEN 5280
5270 NEXT I:GOTO 5180
5280 POKE 764,255:SOUND 0,0,0,0:SOUN
     D 1,0,0,0
5290 RETURN
```

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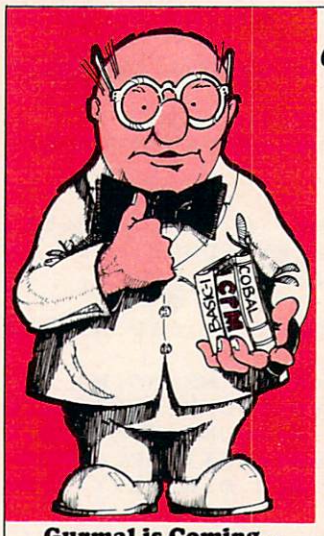

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Using The VIC/64 Function Keys

Jim Butterfield, Associate Editor

The function keys, f1 to f8, seem easy to use and understand. Yet, if you haven't made the right mental connections, they must seem baffling. One of the questions we're asked most often is "How do you make the functions keys work?"

You Can't Input

Let's talk about the INPUT statement for a moment. If your program contains an INPUT statement – or for that matter, if you try typing a direct command – the function keys don't seem to work. They really do work, but to little avail.

The point here is that INPUT takes its information from the screen – and the function keys don't show up on the screen.

When you press one of the keys, it is received and placed into the keyboard input buffer. During an input or direct statement – in other words, whenever the cursor is flashing – the keyboard buffer is promptly emptied and the characters there are printed to the screen. There's the problem: f1, f2, etc., have no printable equivalent, so at this point the characters are lost. Later, INPUT will see you press RETURN and will take its information from the screen, but there are no f-characters there.

In other words, INPUT or normal direct statements will lose the function keys. There's a way around this, but it's awkward: put your input within quotation marks, and the keys will be detected. They will also print oddly, but that's another story.

Another Story – GET

The GET command takes information directly from the keyboard buffer, so it will read these keys without problem. The question is: how does your program test to see if it has an f-key? The answer is easy, but it's rather graphic in nature – so try this on your machine:

```
100 GET X$
110 IF X$="
```

and hold it right there.

At this moment, we're in the middle of line 110, and we've just typed the quotation mark. Now, press the f1 key, and you'll see an odd reverse graphic symbol printed. It's the "programmed cursor" equivalent of the key f1; it looks like a reversed horizontal bar, and for all intents and purposes it is key f1. Now finish the line so it looks like this:

```
110 IF X$="f1" THEN PRINT "FUNCTION 1"
```

Note to readers who have been skimming: don't type the characters f and 1 within the quotation marks; tap key f1 at this point.

Using the same system, we may work through all eight functions:

```
120 IF X$="f2" THEN PRINT "FUNCTION 2"
```

Key f2 is f1 with the shift key held down, of course; it prints a reverse quarter-circle. Keep going:

```
130 IF X$="f3" THEN PRINT "FUNCTION 3"
```

and so on until:

```
180 IF X$="f8" THEN PRINT "FUNCTION 8"
190 GOTO 100
```

You can run this program and play with the f-keys as long as you like. As you can see, the computer recognizes the keys without trouble.

In larger programs, you'll often want to GOTO when you see a given key. That's no trouble at all, of course.

Another Way

Those funny characters can be puzzling. They are hard to read and may be confused with each other. There's no listing standard for them yet. Sometimes it's useful to write them another way, without the funny characters.

```
100 GET X$:IF X$="" GOTO 100
110 X=ASC(X$)
```

We've changed our input key to an ASCII number. Every key has its own ASCII value; if we know the value, we'll know which key.

Now I could tell you the ASCII values for the eight function keys, but I'm not going to do that. Instead, I'll tell you how to find these values for yourself.

Suppose you want to find the ASCII number for key f1. Just type:

```
PRINT ASC("f1")
```

Remember to press the f1 key (don't type f and 1 as two characters), and you'll see the computer respond with a value of 133. That's the ASCII value of key f1.

Now we can continue the above program:

```
120 IF X=133 THEN PRINT "FN 1"
130 IF X=137 THEN PRINT "FN 2"
```

continuing to:

```
190 IF X=140 THEN PRINT "FN 8"
200 GOTO 100
```

I haven't given you the ASCII numbers to fill in the missing lines – but with a little care and attention, you can find them for yourself.

A Simple Example

Let's do a simple quiz, using the odd-numbered f-keys.

```
100 DATA WHO DISCOVERED AMERICA
110 DATA GALILEO, COLUMBUS, REAGAN, EINST
    EIN
120 DATA 2
130 DATA THE CHARGE ON AN ELECTRON IS
140 DATA NEUTRAL,POSITIVE,NEGATIVE,VARIAB
    LE
150 DATA 3
160 DATA UGANDA IS IN
170 DATA ASIA, SOUTH AMERICA, EUROPE, AFR
    ICA
180 DATA 4
190 DATA "*"
200 READ Q$:IF Q$="*" THEN END
210 PRINT Q$;"--"
220 READ A$:PRINT"F1 - ";A$
230 READ A$:PRINT"F3 - ";A$
240 READ A$:PRINT"F5 - ";A$
250 READ A$:PRINT"F7 - ";A$
260 PRINT "YOUR ANSWER? ";
270 READ A
280 GET X$:IF X$="" GOTO 280
290 X=ASC(X$)
300 IF X<133 OR X>136 GOTO 280
310 X=X-132:PRINT "F";X*2-1
320 IF X=A THEN PRINT "RIGHT!":GOTO 340
330 PRINT "WRONG!"
340 GOTO 200
```

You'll notice that line 220 calls for you to type the actual characters (F and 1), and the same goes for lines 230 to 250.

The program isn't the definitive educational package – but it does show how the function keys can be used effectively.

Without A Program

Sometimes you might like to have the function keys do something even when there is no program running. That's much tougher: if your program is not running, it can't do the job. You may have noticed that packages like the Super Expander provide this feature: pressing the f1 key might produce the word GRAPHIC on the screen.

This kind of thing utilizes advanced techniques. You would need to know machine language, and how to implement a wedge. It can be done – but it's not for beginners. ©

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All About The TI Character Set

Michael A Covington

This brief outline of the TI character set explains how the computer recognizes each character. The author discusses some uses of the characters' numeric codes and indicates which characters' graphic representations can be assigned or changed.

Chances are you've never given your computer's character set much thought. You press keys on the keyboard and the characters appear on the screen; that's all there is to it, or so it seems. But there's a lot more going on than meets the eye.

Inside the computer, each character is represented by a *numeric code* – a number between 0 and 255 inclusive. For instance, the code for capital E is 69; the code for an exclamation mark is 33; the code for a blank (a blank is a character just like all the others) is 32. To associate these codes with the characters you see on the screen, the computer has to know two more things about each of them: a *graphic representation* that describes how the character is supposed to look on the screen, and a *key assignment* that indicates what key or combination of keys you can hit on the keyboard to type the character. For instance, the character string "HELLO THERE!" (not counting the quotation marks) involves the following:

Graphic representation:	H	E	L	L	O		T	H	E	R	E	!
Numeric code:	72	69	76	76	79	32	84	72	69	82	69	33
Key assignment:	H key	E key	L key	L key	O key	space bar	T key	H key	E key	R key	E key	shift & 1 keys

Statements Using Numeric Codes

Normally (when you type characters in response to a string INPUT statement or when you type them as part of a program) you enter characters by hitting the keys that correspond to them. That is, you access them by means of their key assignments, and within the program you treat them as character-string data. But there are ways of referring to characters by their numeric codes and treating them as numbers. For instance, the CALL HCHAR and CALL VCHAR statements, which you meet at an early stage as you work through the manuals that come with the computer, refer to characters by their numbers. The statement

```
CALL HCHAR(3,3,69,20)
```

will place a row of 20 capital E's (character number 69) on the screen beginning at row 3, column 3.

Also, you can input characters as numeric codes. The CALL KEY statement senses whether a particular key on the keyboard is up or down; when a key is pressed, CALL KEY gives you the numeric code corresponding to it. For instance, here is a program which will tell you the numeric code of any key on the keyboard:

```
10 PRINT "PRESS ANY KEY..."
20 CALL KEY(5,CODE,STATUS)
30 IF STATUS <> 1 THEN 20
40 PRINT CODE
50 GO TO 10
```

The heart of the program is lines 20 and 30. Line 20 tells the CALL KEY subroutine to look at the keyboard and report what's going on. The variable STATUS will equal 1 only if the condition of the keyboard has changed since the last time the routine looked at it. If STATUS does not equal 1, we simply go back to line 20, since we don't want to do anything more if the user hasn't pressed a key or hasn't yet let go of the one already looked at. The variable CODE contains the numeric code associated with the key being pressed, if any. (The first parameter of CALL KEY, the number 5, simply indicates that we want the

usual BASIC set of codes; specifying other numbers there instructs the computer to use other sets of key assignments for various special purposes.)

The ASC and CHR$ functions allow you to convert back and forth between numeric codes and character strings. If A$ is a character string, ASC(A$) is the numeric code of its first character; thus ASC("E") is 69. Conversely, if N is a number, CHR$(N) is a one-character string of which N is the numeric code; thus CHR$(69) is E. If we want the program above to print the characters themselves rather than their codes, we can convert the codes into characters by changing line 40 to:

```
40 PRINT CHR$(CODE)
```

The CALL CHAR subroutine allows you to alter graphic representations using a hexadecimal code that the manual describes in detail. For instance, if you want to change the dollar sign ($) into a British pound sign (£), just execute the statement:

```
CALL CHAR(36,"001C22207C20207E")
```

That will do it, at least as long as the program is running: the key assignment and numeric code will be the same, but the dollar sign will look like a pound sign. (It will revert to its original appearance when your program stops executing.)

What's Not In The Manual

Those are the preliminaries; now we get to the really interesting part (the part that isn't in the manual, at least not entirely). Internally, the computer can use any number from 0 to 255 as a character code; any such code can be an element in a character string and can be referred to by CALL VCHAR, CALL HCHAR, and CHR$. (In fact, CALL VCHAR, CALL HCHAR, and CHR$ will actually take numbers up to 32767; multiples of 256 are subtracted as necessary to get a number in the 0-to-255 range.) But not all the codes have key assignments or graphic representations. The breakdown (by numeric codes) is as follows:

0 – Undefined (no key assignment, no graphic representation).

1 to 15 – Function keys (Table 1). Most of these characters can be input by means of the CALL KEY statement, but they cannot be typed in normal contexts (for example, in response to an INPUT) because there they are interpreted as requests to perform cursor movements or the like. They have no graphic representations (if you print them, you get blanks or garbled patches).

16 to 29 – Undefined (like 0, these codes have no key assignments and no graphic representations, and there is no straightforward way of giving them either).

30 – The graphic representation of this character is the black square that marks the cursor; thus, CHR$(30) is handy if you want a black square. No key is assigned to it.

31 – This is the screen border character – a blank that is the color of the border rather than the typing area. No key is assigned to it.

32 to 126 – Standard ASCII characters (Table 2). These are the characters you use every day, including the alphabet, the numbers, and all the punctuation marks and mathematical symbols. Their graphic representations can be changed with CALL CHAR but will revert to their original form when the program ends.

127 to 159 – User-defined characters (Table 3). These start out with no graphic representations, but you can define them with CALL CHAR, and, contrary to what the TI manual says, such definitions remain in effect after the program stops running (though most are disrupted when another program is loaded).

What most people don't realize is that these characters can be typed – they have key assignments and are acceptable in the same context as any other character (that is, in response to an INPUT or CALL KEY, or within quotes in a program). All but one of them require you to hold down the CTRL key (at the lower-left corner of the keyboard) when typing them; character number 127 uses the FCTN key instead.

160 to 175 – Undefined.

176 to 198 – These characters have key assignments (Table 4), but no graphic representations and no direct way of giving them any. They can be used as special function keys of some sort (in response to either CALL KEY or INPUT), but not as displayable characters.

199 to 255 – Undefined.

Even the "undefined" character codes (those that cannot be typed on the keyboard or displayed on the screen) are not completely useless. You can refer to them by means of CHR$ and ASC and use them as special markers of various kinds when manipulating character strings. They also may come into play when you are transmitting data to other devices (for example, printers or other computers) that have definitions for characters that are undefined on the TI-99.

Finally, consider this possibility. Each character in a character string has a code between 0 and 255 inclusive, accessible through CHR$ and ASC. Also, the SEG$ function allows you to address individual characters in a string, and the & (concatenation) operator allows you to construct strings out of individual characters. This means that a character string gives you a compact way of storing a set of integers between 0 and 255 – each element occupies only one byte in memory, as compared to the eight bytes normally needed to store a number. So if you have a program that

needs to keep track of thousands of small integers – more than will fit in available memory in numeric form – then character strings may be the answer.

Table 1:
Function Key Codes

(None of these characters have graphic representations, nor can they be given them. They can be typed only through the CALL KEY statement, not in response to a string INPUT statement, or within a program.)

Code	Key
1	FCTN 7 ("AID")
2	None usable. The key definition associated with this code is FCTN 4, but in BASIC, hitting that key interrupts the program.
3	FCTN 1 ("DELETE")
4	FCTN 2 ("INSERT")
5	None usable. The key definition associated with this code is FCTN =, but hitting that key forces a machine reset and the program in memory is lost.
6	FCTN 8 ("REDO")
7	FCTN 3 ("ERASE")
8	FCTN S (left arrow)
9	FCTN D (right arrow)
10	FCTN X (down arrow)
11	FCTN E (up arrow)
12	FCTN 6 ("PROC'D")
13	ENTER
14	FCTN 5 ("BEGIN")
15	FCTN 9 ("BACK")

Table 3:
User-definable Graphics Characters

These characters can be typed using the key combinations listed and are acceptable in any context (that is, they can be input using the CALL KEY or INPUT statements and can appear between quotes within a BASIC program).

Graphic representations can be given to these characters with the CALL CHAR statement. Contrary to TI documentation, such representations, once assigned, will persist after the program stops running.

Code	Key	Code	Key
127	FCTN V	144	CTRL P
128	CTRL , (comma)	145	CTRL Q
129	CTRL A	146	CTRL R
130	CTRL B	147	CTRL S
131	CTRL C	148	CTRL T
132	CTRL D	149	CTRL U
133	CTRL E	150	CTRL V
134	CTRL F	151	CTRL W
135	CTRL G	152	CTRL X
136	CTRL H	153	CTRL Y
137	CTRL I	154	CTRL Z
138	CTRL J	155	CTRL . (period)
139	CTRL K	156	CTRL ;
140	CTRL L	157	CTRL =
141	CTRL M	158	CTRL 8
142	CTRL N	159	CTRL 9
143	CTRL O		

Table 2:
ASCII Graphic Characters On The TI-99/4A

(This table gives the numeric codes and graphic representations; the key assignments are marked on the keyboard. The graphic representations can be changed by the CALL CHAR statements but revert to their original form when the program stops running.)

Code	Graphic Representation	Code	Graphic Representation
32	(space)	53	5
33	!	54	6
34	"	55	7
35	#	56	8
36	$	57	9
37	%	58	:
38	&	59	;
39	'	60	<
40	(	61	=
41	)	62	>
42	*	63	?
43	+	64	@
44	,	65	A
45	- (minus)	66	B
46	.	67	C
47	/	68	D
48	0	69	E
49	1	70	F
50	2	71	G
51	3	72	H
52	4	73	I
74	J	97	a
75	K	98	b
76	L	99	c
77	M	100	d
78	N	101	e
79	O	102	f
80	P	103	g
81	Q	104	h
82	R	105	i
83	S	106	j
84	T	107	k
85	U	108	l
86	V	109	m
87	W	110	n
88	X	111	o
89	Y	112	p
90	Z	113	q
91	[	114	r
92	\ (back slash)	115	s
93	]	116	t
94	^	117	u
95	_ (underline)	118	v
96		119	w
120	x		
121	y		
122	z		
123	{		
124	¦		
125	}		
126	~		
127	See Table 3. TI documentation mistakenly classifies this character with the wrong group.		

Table 4:
Characters With Key Assignments But No Graphic Representations

These characters are not mentioned in TI documentation. They can be typed in any context (that is, in response to an INPUT or CALL KEY statement or between quotes in a program), but they have no graphic representations and cannot be given any.

Code	Key	Code	Key
176	CTRL 0	188	FCTN 0 (zero)
177	CTRL 1	189	FCTN ;
178	CTRL 2	190	FCTN B
179	CTRL 3	191	FCTN H
180	CTRL 4	192	FCTN J
181	CTRL 5	193	FCTN K
182	CTRL 6	194	FCTN L
183	CTRL 7	195	FCTN M
184	FCTN , (comma)	196	FCTN N
185	FCTN . (period)	197	FCTN Q
186	FCTN /	198	FCTN Y
187	CTRL /		

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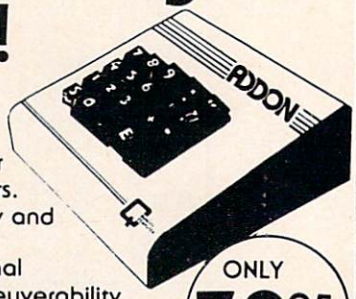

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Andrew Au

When you get a LOAD ERROR, what can you do? Can you recover the program? This article deals with the frustrating problem of tape loading errors. Also, there's a technique here which allows you to LOAD programs twice as fast as usual.

When you save your program, the VIC or 64 saves it twice on the tape. When the program is loaded, the first version is put into the computer and checked against the second version. Any mismatch will cause the LOAD ERROR.

If you get a load error, LIST the program. If it LISTs properly to the end, it can probably be recovered. Don't RUN the program yet, or it will be destroyed. The problem here is that the start of variable pointers are not set. Set these pointers by POKEing the value found by PEEKing 831 into locations 45,47,49; and POKEing the value found by PEEKing 832 into 46,48,50. After performing these six POKEs, make sure that you have done everything correctly by typing PRINT FRE(0). If it shows a decrease in free RAM, your program is ready. Type RUN, and it should work.

However, if the computer just locks up, you have POKEd the wrong values. Press RUN-STOP/RESTORE and rewind the tape to the beginning. Type OPEN 1 and play the tape. After the header is loaded, it will stop. Now 831 and 832 should contain the location of the variable pointer. Perform the above POKEs and try again.

The Solution

When the VIC or 64 loads a program, it sets zero page pointers (which tell it how long the program is) and loads the program itself into BASIC RAM. Apparently, the computer sets the pointers after the program is loaded and checked. If the computer detects a load error, it does not update the pointers. So although you can LIST the program, the computer thinks there is nothing in memory. If the program is RUN at this stage, the variables will overwrite the program and destroy it.

The POKEs given above set the variable pointers to the correct values, which are found in the cassette buffer. Locations 829,830 and 831,832 hold the starting addresses (Lo/Hi) of the program and variables, respectively.

This cure works only if the program itself is loaded successfully. If the program is garbled, this method will not work. Fortunately, many load errors result from this pointer problem, so this technique is well worth knowing.

Loading Time Cut In Half

An 8K program takes two and a half minutes to load. Since the computer loads the program and then checks it, the actual loading takes only half the time. The value of the verification is doubtful since it won't correct any detected errors. All it does is report ?LOADING ERROR. As a rule, machine language programs can be stopped at the middle of the load and RUN (or SYSed to) without problems, since there are no zero page pointers involved. On the other hand, BASIC programs need more attention if they are to RUN at "half time." Since the pointers are not set until the end of the load, they must be typed in manually or incorporated into the program.

Let's prepare a program so that it can be stopped at the middle and RUN (and still work). Add a line at the beginning of the program:

```
POKE 46,PEEK(832): POKE 48,PEEK(832): POK
  E 50,PEEK(832): POKE 45,PEEK(831): POKE
   47,PEEK(831): POKE 49,PEEK(831)
```

Type in the above line (or make it two lines), and make sure it is at the beginning of your program. Now SAVE the program.

When this program is RUN after being stopped at the middle, it will first reset the pointers. Now we don't have to wait for the com-

puter to do it at the end. The result: the program LOADs twice as fast.

This technique can be used with any program to shorten loading time. Use the tape counter to find the middle of the program and allow it to go slightly past.

If you have consistent tape problems, try changing the location of your cassette recorder. Remember that data transmission is sensitive to electrical fields. You should keep the connecting cord away from the back of the TV, which is a strong source. Always verify your programs after saving. ©

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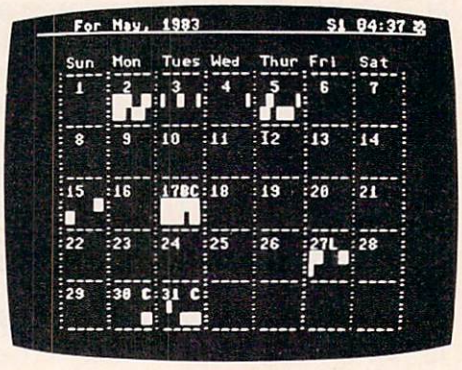

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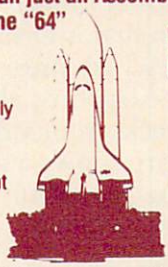

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Make Your Apple User-Friendly

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With an Apple II and a disk drive, you can use this versatile utility program to create menus that call other programs – or you can merge it with your own multi-function programs to create an effective master menu.

If you have an Apple II with Applesoft BASIC and at least one disk drive, this handy utility can save time and prevent confusion by generating menu programs. All you do is tell the program the number of options on your menu and their names. From that information a BASIC program is generated which presents a nicely formatted display of the options, allows the entry of a selection, and checks it for validity.

The figure shows a sample menu created using "Menu Generator." You simply add the code to tell the program where to go after the option has been selected. The Menu program can be used on its own to call other programs, or it can be merged into your own programs using the renumber and merge options in the "Renumber" program on the *System Master* diskette.

```
<1> INITIALIZE DATA DISKETTE
<2> SET UP NEW FILE
<3> ADD ENTRIES TO FILE
<4> CHANGE ENTRIES ON FILE
<5> DELETE ENTRIES ON FILE
<6> PRINT MAILING LIST
<7> PRINT MAILING LABELS
<8> EXIT FROM SYSTEM
```

Menu Generator uses an Apple DOS feature to create a program as a text file and then EXEC it. The EXEC command treats a text file as a series of commands that are executed just as though they had been entered from the keyboard. Delayed execution commands (those that have line numbers in front of them) are saved in memory to await a RUN command. (For more information on EXEC files, see pages 75-79 of the *DOS Manual*.) The EXEC command lets you write a BASIC program that will produce another BASIC program which can be immediately EXECed into memory and RUN, or SAVEd to disk as a program file. Menu Generator is an example of how this feature can be used for almost unlimited program generation.

Program Breakdown

In the Menu Generator program, lines 10-50 initialize the screen and variables. Line 100 sends us to line 1000 to begin processing. Lines 200 and 250 are subroutines that clear either a part of the screen (200) or a given line V (250). These are placed close to the beginning of the program to speed execution.

Lines 1000-1060 input the number of options desired on the menu. A string variable is used to input the number, and lines 1030-1040 scan the input string for valid numeric characters (ASCII 48-57). If an invalid character is detected, a flag (E) is set. The flag is then tested in line 1050, and, if true, execution is returned to the input statement at 1020.

This may seem a cumbersome process, since using a numeric variable would obviate the need for lines 1030-1050. However, in applications where an attractive screen format is important, this routine avoids the ?REENTER statement which appears if you try to enter a nonnumeric character into a numeric variable.

The options to appear on the menu are entered in lines 1070-1200. The array OP$ holds the option names, and the array element number also functions as the option number. For example, if option number 1 on the menu is to be INITIALIZE

DATA DISKS, then that will be the contents of OP$(1). After all the options are entered and checked for length of less than 30 characters, the program checks to see if changes are desired (1210-1420).

Beginning at line 2000, the text file which builds the program is created. The text file is opened in lines 2010-2040, and the first line is printed at 2045. Since the EXEC command itself does not clear the program currently in memory, the first line of the exec file issues an FP command, which prevents the EXECed program from overlaying the calling program. The POKE 34,24 in lines 2047 and 1420 prevents the screen from scrolling and the cursor from bouncing around while the EXEC file is being processed.

Menu Generator Variable List

A$	– yes or no answer input
CH$	– holds a single character for error checking
D$	– return + control-D (CHR$(13) + CHR$(4))
E	– error flag
H	– horizontal print location
I	– counter for FOR/NEXT loops
L	– length of longest option
L1	– temporarily holds length of each option
N	– number of options on menu
N$	– number of options (input string)
NN	– option number to change
NN$	– option number to change (input string)
N1	– option number selected on menu
OP$	– array holding option names
Q$	– quote mark (CHR$(34))
V	– vertical print location

Creating The New Program

The beginning of the new program being created (the menu program itself) is at line 2050. Lines 2050-2220 actually write the menu program, beginning with the header which will be lines 10-30 in the new program (lines 2050-2070 in the creating program). The variable N is set equal to the number of options, and the array OP$ is DIMed to N in line 40 (2080). The array OP$ is loaded with the option names in line 50 (2090), and line 2110 of the creating program causes the OP$ array to be printed as the DATA statement of line 70 of the new program. The length of the longest option line is found in line 2120; this information is used to calculate the horizontal positioning in line 2140. The same line also calculates the vertical positioning using the number of options (N).

After displaying the menu options, the program asks for the selection to be input. Input and validation procedures (2180-2220) are the same as those used for the option number input in the creating program. Line 2220 is the end of the delayed execution part of the text file, and it remains in memory while the EXEC function continues to the last two lines of the text file. Line 3010 causes the program which has been LOADed into memory from the text file to be SAVEd to disk as a program file called MENU-PROGRAM, and the next line causes it to be RUN.

Printing of the text file is concluded by line 3040, which CLOSEs the text file. The last line of the program issues the DOS EXEC command, which executes the text file. You now have the menu program SAVEd on disk and displayed on the screen, ready to make any modifications you might wish.

Menu Generator

```
1  REM   "************************"
2  REM   "*   MENU GENERATOR    *"
6  REM   "************************"
10  REM
20  TEXT : HOME : HTAB 13: PRINT "MENU
    GENERATOR"
30  VTAB 2: HTAB 1: FOR I = 1 TO 40: PRINT
    "-";: NEXT I
40  DIM OP$(12)
50 D$ =  CHR$ (13) +  CHR$ (4):Q$ =  CHR$
    (34): REM D$=CONTROL-D;Q$=QUOTE MA
    RK
100  GOTO 1000
199  REM  COMMONLY USED SUBROUTINES
200  VTAB 22: HTAB 1: CALL  - 956: VTAB
    22: RETURN
250  VTAB V: HTAB 1: CALL  - 868: VTAB
    V: RETURN
999  REM
1000  REM  ENTER NUMBER OF OPTIONS DESI
    RED ON THE MENU
1001  REM
1010  GOSUB 200: HTAB 1: PRINT "YOU MAY
     CHOOSE UP TO 12 MENU OPTIONS OF":
     PRINT "UP TO 30 CHARACTERS EACH I
    N LENGTH"
1020 V = 5: GOSUB 250: INPUT "ENTER NUM
    BER OF MENU OPTIONS (1-12) ";N$
1030 E = 0: FOR I = 1 TO  LEN (N$):CH$ =
     MID$ (N$,I,1):CH =  ASC (CH$): IF
    CH < 48 OR CH > 57 THEN E = 1
1040  NEXT I
1050  ON E GOTO 1060,1020
1054  REM
1055  REM  ENTER THE MENU OPTIONS
1056  REM
1060 N =  VAL (N$): IF N < 1 OR N > 12 THEN
     GOTO 1020
1070 V = 7: GOSUB 250: PRINT "ENTER OPT
    ION NAME NEXT TO THE NUMBER"
1075  GOSUB 200: PRINT "NO COMMAS, COLO
    NS OR QUOTE MARKS IN THE": PRINT "
    MENU OPTIONS PLEASE"
1080  FOR I = 1 TO N
1090 V = 7 + I: GOSUB 250: PRINT I;: INPUT
    " ";OP$(I)
1100  IF  LEN (OP$(I)) > 30 THEN  GOTO
    1090
1200  NEXT I
1210 V = 20: GOSUB 250: PRINT  TAB( 10)
    "ANY CHANGES (Y/N) ";: GET A$: IF
    A$ = "N" THEN  GOTO 1400
1220  IF A$ <  > "Y" THEN  GOTO 1210
1230 V = 20: GOSUB 250: PRINT  TAB( 5)"
    CHANGE NO. OF OPTIONS (Y/N) ";: GET
```

```
     A$: IF A$ = "N" THEN  GOTO 1300
1240  IF A$ <  > "Y" THEN  GOTO 1230
1250  GOTO 1000
1300 V = 20: GOSUB 250: HTAB 5: INPUT "
     ENTER OPTION NUMBER TO CHANGE ";NN
     $: IF  LEN (NN$) > 2 THEN  GOTO 13
     00
1310 E = 0: FOR I = 1 TO  LEN (NN$):CH$
      =  MID$ (NN$,I,1): IF  ASC (CH$) <
     48 OR  ASC (CH$) > 57 THEN E = 1
1320  NEXT I
1330  ON E GOTO 1340,1300
1340 NN =  VAL (NN$): IF NN < 1 OR NN >
     N THEN  GOTO 1300
1350 V = 7 + NN: GOSUB 250: PRINT NN;: INP
     UT" ";OP$(NN)
1360  IF  LEN (OP$(NN)) > 30 THEN  GOTO
     1350
1370  GOTO 1210
1400  FOR I = 1 TO N:L1 =  LEN (OP$(I))
     : IF L1 > L THEN L = L1
1410  NEXT I
1420  POKE 34,24
2000  REM  BUILD TEXT FILE
2010  PRINT D$;"OPEN MENU-FILE"
2020  PRINT D$;"DELETE MENU-FILE"
2030  PRINT D$;"OPEN MENU-FILE"
2040  PRINT D$;"WRITE MENU-FILE"
2045  PRINT "FP"
2047  PRINT "POKE 34,24"
2050  PRINT "10 REM MENU PROGRAM"
2053  PRINT "12 TEXT:HOME"
2055  PRINT "15 VTAB 1:FOR I=1 TO 40:PR
     INT "Q$"-"Q$";:NEXT I"
2060  PRINT "20 VTAB 2:PRINT TAB(18) "Q
     $"MENU"Q$
2070  PRINT "30 VTAB 3:FOR I=1 TO 40:PR
     INT "Q$"-"Q$";:NEXT I"
2080  PRINT "40 N=";N;":DIM OP$(";N;")"
2090  PRINT "50 FOR I=1 TO N:READ OP$(I
     ):NEXT I"
2100  PRINT "60 GOTO 80"
2110  PRINT "70 DATA ";: FOR I = 1 TO N
     - 1: PRINT OP$(I);",";: NEXT I: PRINT
     OP$(N)
2120  PRINT "80 FOR I=1 TO N:L1=LEN(OP$
     (I)):IF L1>L THEN L=L1"
2130  PRINT "90 NEXT I"
2140  PRINT "100 V=(INT(24-N)/2)-1:H=IN
     T((40-(L+4))/2)"
2160  PRINT "110 IF N<=9 THEN FOR I=1 T
     O N:VTAB V+I:PRINT TAB(H) "Q$"<"Q$
     "I"Q$"> "Q$";OP$(I):NEXT:GOTO 120"
2170  PRINT "112 FOR I=1 TO 9:VTAB V+I:
     PRINT TAB(H) "Q$"<"Q$"I"Q$"> "Q$";
     OP$(I):NEXT I"
2175  PRINT "114 FOR I=10 TO N:VTAB V+I
     :PRINT TAB(H-1) "Q$"<"Q$"I"Q$"> "Q
     $";OP$(I):NEXT I"
2180  PRINT "120 VTAB 23:HTAB 8: INPUT
     "Q$"ENTER SELECTION : "Q$";N$"
2190  PRINT "130 IF LEN(N$)>2 OR LEN(N$
     )<1 THEN GOTO 120"
2200  PRINT "140 E=0:FOR I=1 TO LEN(N$)
     :CH$=MID$(N$,I,1):IF ASC(CH$)<48 O
     R ASC(CH$)>59 THEN E=1"
2210  PRINT "150 NEXT I:IF E=1 THEN GOT
     O 120"
2220  PRINT "160 N1=VAL(N$):IF N1<1 OR
     N1>N THEN GOTO 120"
3010  PRINT "SAVE MENU-PROGRAM"
3030  PRINT "RUN"
3040  PRINT D$;"CLOSE"
3050  PRINT D$;"EXEC MENU-FILE"
```


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Variable Lister

E. A. Cottrell

This utility lists all your program variables in order, including variable type (simple, array). It's a helpful tool, especially for checking long programs and writing documentation. For the VIC and 64.

There are two types of variables, simple and array, and three categories in each type, floating point numeric, integer numeric, and string. All of these variables are stored in the VIC and 64 immediately after the BASIC program.

The simple variables are stored below the arrays starting at the address pointed to by memory locations 45 and 46 (see box). Each of these simple variables occupies seven bytes of memory. The first two bytes contain the first two characters (in ASCII) of the name of the variable, with coding to indicate which type of variable it is. This coding is accomplished by adding 128 to both characters if it is an integer variable and by adding 128 to the second character if it is a string variable. No coding indicates a floating point variable. The remaining bytes in numeric variables contain the value of the variable. In the case of string variables, the remaining bytes contain the length of the string and the location at the top of memory which contains the first character of the string.

Arrays are quite different in that the length of the variable is determined by the number of elements in the array. The information which must be stored for an array variable includes the name of the variable, which is coded the same as for a simple variable, a pointer to the location of the next variable, the number of dimensions in the array, and the number of elements in the array.

In addition, the value of each element in the case of numeric arrays, or the pointer to the string and its length for string arrays, must be stored. As you can see, array variables can eat up a lot of memory in a hurry. It is best to use the lowest possible number of elements in your arrays. If you do not specify the size of an array, the computer will set it at ten elements. If you need less than ten, you will save a minimum of five bytes per element if you establish the size of the array with a DIMension statement. Although a simple integer variable takes up the same amount of memory as a simple floating point variable, three bytes per element can be saved if you use integer instead of floating point variables in arrays.

LOADing The Lister

"Variable Lister" is a machine language (ML) program which is loaded by POKEs using a BASIC program, thus eliminating the need for an assembler. The ML is automatically loaded into the top of memory and protected from your BASIC program. Before you RUN the program, be sure to SAVE a copy since it self-destructs after it is run. When the machine language is loaded, the loader program will give you the location to SYS to when you want to list your variables. For example, with 16K of expansion memory plugged into your VIC, you would type SYS 24320 in order to list your variables. The program will then list the simple variables in the order of appearance in the program, with indicators of their type. Next the array variables will be listed with proper indicators.

Variable Lister is especially useful when you write programs with many variables and have to find new names. It is also valuable for documenting programs when they are completed.

The variables are listed across the screen to prevent them from scrolling out of view. If you have a printer, the following changes may be made to give you a listing which may be easier to read.

```
160 IF PA <> 33632 THEN PRINT "DATA ERROR
    ":END
```

Address Pointers

Now and then you'll see a reference to "pointers" within the computer's memory. These are two-byte long numbers, usually located in the first 256 memory cells of the computer, which hold an important address.

Things change while a program is running or being written. For example, if you add a line to a BASIC program, you've expanded the amount of space that the program is taking up in RAM memory. Obviously, when you go to SAVE the program, the computer has to know where the BASIC program ends. So, it keeps track of the "current top of BASIC program" in a pointer. This pointer is located (in the VIC and 64) in addresses 45 and 46. The number held in cell 46 is multiplied by 256 and then added to the number in cell 45. To see at which address in RAM memory your current BASIC program ends, you can type: ? PEEK (45) + PEEK (46) * 256.

There are a number of other pointers as well, including "limit of memory," "start of arrays," "string storage," and "start of BASIC." The locations of these pointers are listed in *memory maps* for each computer which have been published in COMPUTE! and in various COMPUTE! Books. They are also frequently available from user groups. There are some interesting things you can do by manipulating these pointers with POKEs. For one thing, you could fool the computer into reserving space for programs in odd places, or even partitioning memory so that two independent BASIC programs could run simultaneously. In any event, pointers hold information essential to the computer, and their values can be accessed using the formula above.

```
260 DATA 32,210,255,169,13,32,210
420 DATA 41,32,210,255,169,13,32
```

To send the list to your printer, simply OPEN a file to your printer:

```
OPEN1,4 :CMD1:SYSXXXXX
```

The BASIC program for which you wish to list variables must be RUN before you give the SYS to start the Lister. This is because the variables are not set up in memory until a program is RUN. If you're a VIC owner, this program works well in conjunction with "VIC Searcher" (COMPUTE!, February 1983). First, list the variables with Variable Lister, then find the lines on which they appear with the Searcher. Both of these programs may be loaded together. Remember that if you use the Searcher program, remove line 0 and RUN the program before using the Lister.

Variable Lister

```
120 ME= PEEK(55) + 256 * PEEK(56)
130 VS= ME - 256: PA= 0
140 POKE 56, PEEK(56) -1
150 FORI= VS TO VS + 240: READ A: POKE I,
     A: PA= PA + A: NEXT
160 IF PA <> 33670 THEN PRINT "DATA ERROR
    ": END
170 PRINT "SYS" VS "TO START": NEW
180 DATA 165,45,197,47,240,93,133
190 DATA 253,165,46,133,254,160,0
200 DATA 169,0,141,61,3,177,253
210 DATA 41,128,208,60,177,253,41
220 DATA 127,32,210,255,200,173,61
230 DATA 3,201,0,208,6,177,253
240 DATA 41,128,208,46,177,253,41
250 DATA 127,32,210,255,173,61,3
260 DATA 32,210,255,169,32,32,210
270 DATA 255,152,24,105,6,144,5
280 DATA 164,254,200,132,254,168,101
290 DATA 253,197,47,240,17,208,186
300 DATA 96,169,37,141,61,3,208
310 DATA 189,169,36,141,61,3,208
320 DATA 203,165,49,197,47,240,114
330 DATA 165,47,133,253,165,48,133
340 DATA 254,160,0,169,0,141,61
350 DATA 3,177,253,240,216,41,128
360 DATA 208,77,177,253,41,127,32
370 DATA 210,255,200,173,61,3,201
380 DATA 0,208,6,177,253,41,128
390 DATA 208,63,177,253,41,127,32
400 DATA 210,255,173,61,3,32,210
410 DATA 255,169,40,32,210,255,169
420 DATA 41,32,210,255,169,32,32
430 DATA 210,255,200,177,253,24,101
440 DATA 253,197,49,240,39,177,253
450 DATA 24,101,253,170,200,177,253
460 DATA 101,254,133,254,134,253,208
470 DATA 165,96,169,37,141,61,3
480 DATA 208,172,169,36,141,61,3
490 DATA 208,186,165,48,197,50,208
500 DATA 136,96,200,234,177,253,101
510 DATA 254,197,50,240,224,16,222
520 DATA 136,208,202
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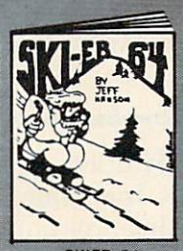

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Atari Polycopy

Edward Boyer

This convenient utility program lets you copy at least 16 selected files from one or more disks – all in a single pass. It's also useful for reformatting a disk with multiple files.

"Polycopy" is a disk file copy utility designed for users with only one disk drive; many Atari owners will therefore find this program useful. Using a minimum DOS on a 48K system, it can copy over 225 sectors in a single pass. With the exception of DOS.SYS (which it never copies), an entire disk can be copied in only three passes. Polycopy is expecially handy if you must reformat a disk with multiple files. You will also find it useful when you're copying programs or files.

What makes this program different from Atari DOS disk and file copy is its ability to selectively copy more than one file in a single pass. Polycopy uses machine language routines to perform the disk I/O. These routines are far more efficient than the BASIC GET and PUT instructions. In an effort to save all available RAM, Polycopy deletes its initialization lines once initialization is complete. It will become a valuable part of your disk library.

Program Operation

After initialization, you will be asked to insert a FROM disk; insert the disk and press any key. Each filename on the disk will be displayed. Type a C if you want the file copied, a Q if you're finished with this disk, or any other key to bypass this file. The files will continue until all have been displayed or the maximum of 16 files has been selected. You can increase or decrease the limit of 16 by changing the value of DSN in line 395.

You will then be asked for another FROM disk if fewer than 16 files have been requested. If you respond with a Y, the process will continue, allowing you to select more files from a different disk.

If you respond N for additional disks, you will be asked to review the filenames selected (all will still be on the screen). If you're in agreement, press Y and the copying will proceed. If you press any other key, the copy is aborted.

As the program runs, you will be prompted to insert FROM and TO disks at the appropriate times. Also, progress reports will be given to inform you that all is proceeding well.

Error Handling

During the loading pass, if Polycopy can't find a file on the disk in use, it will ask you if you want to try another disk. If you respond Y, it will prompt you to insert a new FROM disk. If you respond N, it will skip to the next requested file, thus ignoring the file it couldn't find.

If a full disk condition occurs while writing on the TO disk, you will be told of the condition and asked if you want to try another disk. If you answer Y, the partial file will be erased from the current disk, and you will be requested to insert a new TO disk. It is extremely important that you not remove the current disk or insert a new one until requested, because Polycopy erases the partial file from the current disk *before* requesting you to change it.

If the program uses all the available RAM before it finishes reading a file, it will write out the current portion to the new disk then retrieve the remainder on the next pass. This will be noted by the presence of a slash (/) after the size. If a full disk condition occurs during the writing of a split file, you will be asked to insert the FROM disk (the one with the file that was originally split). It will then recopy the file in its entirety, before requesting a new TO disk.

It is important that you respond to the ques-

tions and prompts only when requested; don't change disks until you are asked to. Impatience here can lead to irrecoverable files.

Any other I/O errors encountered will result in the skipping of the file currently being processed.

You may abort Polycopy anytime by pressing the ESCAPE key. It's important to use this rather than BREAK or SYSTEM RESET since it provides an orderly (although not always immediate) termination, thus insuring the integrity of your files and no misallocated sectors on the disk.

Program Explanation

Lines 15-40 set up the table of files to be copied.

Lines 45-125 load files into buffer, check for errors and full buffer.

Lines 130-225 write files on new disk from buffer, check for errors and full disk.

Line 230 places the next filename to be read or written in DSN$.

Lines 250-320 build table of filenames to be copied by displaying filenames found in disk directory.

Lines 325-370 – miscellaneous prompts and input routines.

Lines 375-455 define variables, open the keyboard, and POKE the machine language routine into the printer buffer.

Lines 450-455 delete lines 375-450 to make additional room.

Line 460 allocates most of available RAM as the copy buffer.

Note: Line 445 bypasses the routine to delete lines 375 through 450 to allow you to test Polycopy conveniently. This line should be removed from your operational version to allow the largest possible buffer.

If you don't want to type in Polycopy, I will make a copy for you. Send a blank formatted disk, a postage-paid return mailer, and $3 to:

Edward Boyer
81 Sequoia Drive
Coram, NY 11727

Polycopy

```
10 GOTO 375
15 GRAPHICS K0:PRINT "POLYCOPY - ATA
   RI version 2.0"
20 PRINT "(Space for ";INT(BUFF/125)
   ;" sectors)":PRINT :IP=-K1
25 GOSUB 250:IF IP=DSN THEN 40
30 IF IP<DSN THEN GOSUB 355:IF Z=YES
    THEN 25
35 IF IP<K1 THEN 235
40 MAX=IP-K1:PRINT "Type 'Y' if o.k.
    ";:GOSUB 335:PRINT :IF Z<>YES TH
   EN 235
45 IP=K0:OP=K0:SPLIT=HI:APND=HI:GOTO
    55
50 PRINT :GOSUB 325
55 ADDR=ADR(Y$):ROOM=BUFF
60 IF IP>MAX THEN IP=IP-K1:GOSUB 145
   :GOTO 240
65 Y=IP:GOSUB 230:TRAP 80:OPEN #K1,K
   4,K0,DSN$:TRAP TOFF
70 IF SPLIT<>IP THEN PRINT "Loading
   ";DSN$;:GOTO 100
75 TRAP 80:POINT #K1,SEC,BYTE:TRAP T
   OFF:APND=IP:PRINT "Contin'g ";DSN
   $;:GOTO 100
80 TRAP TOFF:Z=PEEK(195):CLOSE #K1:I
   F Z<>170 THEN 110
85 PRINT :PRINT DSN$;" not found,":P
   RINT "..do you want to try anothe
   r disk?";
90 GOSUB 350:PRINT :IF Z=YES THEN PR
   INT "Insert new disk";:GOSUB 330:
   GOTO 65
95 X(IP,K0)=K0:IP=IP+K1:GOTO 60
100 X(IP,K0)=ADDR
105 SIZE=USR(CIO,K1,7,ADDR,ROOM):Z=P
    EEK(851):IF Z<128 OR Z=136 THEN
    115
110 CLOSE #K1:PRINT :GOSUB 370:GOTO
    95
115 PRINT " size=";SIZE;:X(IP,K1)=SI
    ZE:IF Z=136 THEN 125
120 PRINT "/";:NOTE #K1,SEC,BYTE:SPL
    IT=IP
125 PRINT :CLOSE #K1
130 ADDR=ADDR+SIZE:ROOM=ROOM-SIZE:IF
     ROOM>K0 THEN IP=IP+K1:GOTO 60
135 GOSUB 145:IF SPLIT<>IP THEN IP=I
    P+K1:IF IP>MAX THEN 60
140 GOTO 50
145 IF ROOM=BUFF THEN RETURN
150 PRINT :PRINT "Insert 'to' disk";
    :GOSUB 330
155 ADDR=X(OP,K0):SIZE=X(OP,K1):IF A
    DDR=K0 THEN 220
160 Y=OP:GOSUB 230:Z=8:IF APND=OP TH
    EN Z=Z+K1
165 TRAP 185:OPEN #K2,Z,K0,DSN$:TRAP
     TOFF:IF APND=OP THEN PRINT "App
    end'g ";:GOTO 175
170 PRINT "Writing ";
175 PRINT DSN$;" size=";SIZE
180 Z=USR(CIO,K2,11,ADDR,SIZE)
185 Z=PEEK(867)
190 TRAP 190:CLOSE #K2:TRAP TOFF:IF
    Z<128 THEN 220
195 IF Z<>162 THEN GOSUB 370:GOTO 22
    0
200 PRINT "Disk full, try another? [
    answer first]";:GOSUB 335:IF Z<>
    YES THEN 235
205 TRAP 210:XIO 33,#K2,K0,K0,DSN$
210 TRAP TOFF:IF APND<>OP THEN PRINT
     "Insert new disk";:GOSUB 330:GO
    TO 155
215 IP=OP:SPLIT=HI:APND=HI:POP :GOTO
     50
220 IF OP<IP THEN OP=OP+K1:GOTO 155
225 RETURN
230 DSN$="D:":DSN$(K3)=X$(Y*K12+K1,Y
    *K12+K12):GOTO 360
235 PRINT :PRINT "[user aborted!!]"
240 GOSUB 355:IF Z=YES THEN 15
245 CLR :END
250 GOSUB 325:CLOSE #K3:OPEN #K3,6,K
    0,"D:*.*":IF IP<K0 THEN IP=K0:X$
    ="":PRINT "[C-copy, Q-quit, any
    key to skip]"
255 INPUT #K3,Y$:IF LEN(Y$)<17 THEN
    320
```

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```
260 DSN$="":FOR Z=K3 TO 13:IF Z=11 T
    HEN DSN$(LEN(DSN$)+K1)="."
265{3 SPACES}IF Y$(Z,Z)=" " THEN 275
270{3 SPACES}DSN$(LEN(DSN$)+K1)=Y$(Z
    ,Z)
275{3 SPACES}NEXT Z:IF DSN$="DOS.SYS
    " THEN 255
280 IF LEN(DSN$)<K12 THEN DSN$(LEN(D
    SN$)+K1,K12)="{11 SPACES}"
285 SEC=K0:TRAP 290:SEC=VAL(Y$(15,17
    ))
290 TRAP TOFF:PRINT IP+K1;:POKE COL,
    5:PRINT DSN$;:POKE COL,22:PRINT
    SEC;:POKE COL,28:PRINT "?";:GOSU
    B 340
295 IF Z=67 THEN PRINT CHR$(30);"C":
    GOTO 310
300 PRINT CHR$(ERASE);:IF Z=81 THEN
    320
305 GOTO 255
310 X$(LEN(X$)+K1)=DSN$:IP=IP+K1:IF
    IP=DSN THEN 320
315 GOTO 255
320 CLOSE #K3:RETURN
325 PRINT "Insert 'from' disk";
330 PRINT ", press any key!";
335 GOSUB 340:PRINT CHR$(ERASE);:RET
    URN
340 GET #K4,Z:IF Z=27 THEN POP :GOTO
     235
345 RETURN
350 GOSUB 340:PRINT :RETURN
355 PRINT :PRINT "Any more files?";:
    GOTO 335
360 Z=PEEK(764):POKE 764,HI-K1:IF Z=
    28 THEN 235
365 RETURN
370 PRINT "[";Z;"] I/O error on ";DS
    N$:PRINT "...skipping to next fi
    le!":PRINT :RETURN
375 REM Delete lines beginning here
    !
380 GRAPHICS K0:POSITION 13,12:PRINT
     " PLEASE WAIT!";
385 K0=0:K1=1:K2=K1+K1:K3=K2+K1:K4=K
    3+K1:K12=K4*K3:HI=256:TOFF=40000
390 YES=89:LET ERASE=156:COL=YES-K4:
    OPEN #K4,K4,K0,"K:"
395 DSN=16:DIM DSN$(16),X$(DSN*K12),
    X(DSN-K1,K1)
400 CIO=960:FOR Y=K0 TO 42:READ Z:PO
    KE CIO+Y,Z:NEXT Y:POKE 709,PEEK(
    710)
405 DATA 104,104,104,10,10,10,10,170
410 DATA 104,104,157,66,3,104,157,69
415 DATA 3,104,157,68,3,104,157,73
420 DATA 3,104,157,72,3,32,86,228
425 DATA 189,72,3,133,212,189,73,3
430 DATA 133,213,96
435 MAX=842:APND=35
440 IP=375:OP=450:REM These are the
    'from' and 'to' delete line num
    bers!
445 GOTO 460:REM Remove this line t
    o allow deletes!
450 PRINT CHR$(125):PRINT :FOR Z=IP
    TO OP STEP 5:PRINT Z:NEXT Z:PRIN
    T "CONT":POSITION K0,K0:POKE MAX
    ,13
455 STOP
460 POKE MAX,K12:BUFF=FRE(K0)-APND:D
    IM Y$(BUFF):BUFF=BUFF-K3:GOTO 15
```

PEEK And PRINT For The VIC-20

Carolyn D. Bellah

These two programs let you design and display characters four times normal size. You can store up to seven of these larger characters and recall them later for screen displays or a printout.

The two programs here allow you to design large custom characters, twice as high and twice as wide as regular characters, save them, and print them.

Program 1 sets up a programmable character grid in which you move your cursor to a desired location on the grid and hit any letter key to print at that location.

Several options are available in Program 1. There is a color (1 to 8) choice, an option to save or erase your created character, and an option to draw another. Seven characters can be stored in a protected area of RAM and can be recalled, printed, and listed in sequence by using Program 2.

Another useful feature is that the program will display the decimal PEEK values (the numeric values that are used for DATA statements) that represent your finished character. You can use Program 1 without Program 2. Program 1 isn't a long program, but it does use most of the available memory in the unexpanded VIC. For this reason, REM statements are not included. When typing in this program, do not use unnecessary spaces.

When you finish designing with Program 1, type NEW (be sure to save a copy first), and enter Program 2. This second program allows you to examine memory to see the decimal values for the data created by Program 1, and to print the values (to screen and graphics printer) along with your created character.

Program 2 also allows you to print a reversed image of your created character and the corresponding decimal PEEK values.

Here's an explanation of the programs.

Program 1

Lines

8-9	Reset top of memory pointers; copy 32 characters into protected RAM; DIMension array to recall marked grid for revision; set variables for characters and display; leave a clean slate to draw on.
10	Create string to draw grid (shifted @ key) and strings for positioning characters, inputs, etc., throughout program.
11	Array from which bit values are read.
14-16	Draw grid and set up display.
17-30	Keyboard controls.
31-33	Read grid, store values, display design.
34-36	Offer options and, with 59-63, show figure in chosen color moving around screen.
48-49	Print figure and values. The last number printed is the next address to be POKEd. If this is 7672, all available characters have been programmed.
49-54	Offer options.
64-70	Redraw marked grid for revision after display in color and motion.

Program 2

Lines

10-50	Set up display of design; print DATA values; show first and last address PEEKed.
55	Get a name for the design being displayed.
60-140	Set up display of character reversed horizontally.
170	Increment CHR$ for next design.
200-250	PEEK registers; reverse values; list them in proper order for program use.
600-620	Restructure the data for use by the screen dump routine.
60000-60070	Print a copy of the character design on a VIC 1515 or 1525 graphics printer.

(Program 2 is also handy for checking out the contents of other locations. Just change the value of PC in line 10 from 7448 to whatever address interests you.)

Program 1: Character Creator

```
2 PRINT"{CLR}"SPC(5)"{DOWN}{RED}PROGRAMMA
  BLE":PRINTSPC(4)"CHARACTER GRID"
3 PRINT"{2 DOWN}{BLK}BEGIN AT TOP LEFT. "
  ;
4 PRINT"THECURSOR{2 SPACES}CONTROLS
  {2 SPACES}AND SPACE BAR WILL BEHAVE NOR
  MALLY. ALPHANUMERICKEYS ";
5 PRINT"MARK THE GRID.":PRINT"{2 DOWN}HIT
   F1 TO SEE DESIGNEDCHARACTER.
6 PRINT"{GRN}{2 DOWN}{RIGHT}HIT RETURN TO
   BEGIN
7 GETM$:IFM$<>CHR$(13)THEN7
```

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```
8 POKE52,29:POKE56,29:CLR:FORI=7424TO7679
  :POKEI,PEEK(I+25600):NEXT:DIMCT%(255):J
  =35
9 PC=7448:FORI=7448TO7679:POKEI,0:NEXT
10 G$="{RVS}@@@@@@@@@@@@@@@@":P$="{HOME}
  {19 DOWN}":P1$="{22 RIGHT}"
11 A$(0)="128":A$(1)="64":A$(2)="32":A$(3
  )="16":A$(4)="8":A$(5)="4":A$(6)="2":A
  $(7)="1"
12 PRINT"{CLR}":POKE36869,255:FORG=1TO16:
  PRINT"{BLK}"G$:NEXT
13 PRINT"{HOME}{UP}{RVS}{BLK}876543218765
  4321":FORX=1TO8:PRINT"{RVS}"LEFT$(P$,1
  +X)LEFT$(P1$,16)X:NEXT
14 FORX=1TO8:PRINT"{RVS}"LEFT$(P$,9+X)LEF
  T$(P1$,16)X:NEXT
15 CR$="{2 SPACES}{DOWN}{2 LEFT}"+CHR$(J)
  +CHR$(J+1)+"{DOWN}{2 LEFT}"+CHR$(J+2)+
  CHR$(J+3)+"{DOWN}{2 LEFT}{2 SPACES}"
16 PRINT"{OFF}{HOME}{2 DOWN}"LEFT$(P1$,18
  )CR$LEFT$(P$,20)"{RVS}{GRN}HIT F1 TO S
  EE DESIGN.{HOME}"
17 GETM$:IFM$=""THEN17
18 IFPEEK(211)=16ANDPEEK(210)=31ANDPEEK(2
  09)>90THENPRINT"{HOME}{DOWN}";
19 IFPEEK(210)=31ANDPEEK(209)>100THENPRIN
  T"{HOME}{DOWN}";
20 IFPEEK(211)=16THENPRINT:GOTO17
21 IFM$<>CHR$(20)ANDM$<>CHR$(148)THEN22
22 IFM$=CHR$(13)THENPRINTCHR$(13);:GOTO17
23 IFM$=CHR$(17)THENPRINTCHR$(17);:GOTO17
24 IFM$=CHR$(29)THENPRINTCHR$(29);:GOTO17
25 IFM$=CHR$(145)THENPRINTCHR$(145);:GOTO
  17
26 IFM$=CHR$(157)ANDPOS(M$)<>0THENPRINTCH
  R$(157);:GOTO17
27 IFM$=CHR$(32)THENPRINT"{RVS}{BLK}"CHR$
  (186);:GOTO17
28 IFM$=CHR$(133)THENPRINTCHR$(133):GOTO3
  1
29 PRINT"{RVS}{BLU}"CHR$(166);
30 GOTO17
31 B=0:L=7702:FORY=1TO2:FORZ=LTOL+154STEP
  22:D=0:C=0:GOSUB56:PC=PC+1:NEXT:L=L+8:
  NEXT
32 L=7878:FORY=1TO2:FORZ=LTOL+154STEP22:D
  =0:C=0:GOSUB56:PC=PC+1:NEXT:L=L+8:NEXT
33 FORSC=8076TO8186:POKESC,32:NEXT
34 PRINTLEFT$(P$,19)"{RVS}LIKE IT? ";:INP
  UT"{RVS}Y OR N";N$
35 IFN$="Y"THEN37
36 IFN$="N"THENPRINTLEFT$(P$,19)"{RVS}CUR
  SOR IS AT TOP LEFT":PC=PC-32:PRINT"
  {HOME}":GOTO17
37 PRINT"{CLR}":INPUT"{RVS}COLOR - 1 TO 8
   ";E
38 ONEGOTO39,40,41,42,43,44,45,46
39 PRINT"{BLK}":GOSUB59:GOTO47
40 POKE36879,110:PRINT"{WHT}":GOSUB59:PRI
  NT"{BLK}":GOTO47
41 PRINT"{RED}":GOSUB59:GOTO47
42 PRINT"{CYN}":GOSUB59:GOTO47
43 PRINT"{PUR}":GOSUB59:GOTO47
44 PRINT"{GRN}":GOSUB59:GOTO47
45 PRINT"{BLU}":GOSUB59:GOTO47
46 PRINT"{YEL}":GOSUB59:GOTO47
47 POKE36879,27:PRINT"{CLR}{DOWN}
  {8 RIGHT}"CR$:PRINTLEFT$(P$,8);
48 PC=PC-32:FORCH=1TO4:FORX=PCTOPC+7:PRIN
  T"{RVS}{BLK}"PEEK(X);:PC=PC+1:NEXT:PRI
  NT:NEXT
49 PRINT"{RVS}"PC:INPUT"{RVS}WANT TO SEE
  {SPACE}IT AGAIN";N$
50 IFN$="Y"THEN37
51 INPUT"{RVS}REVISE IT";Q$
52 IFQ$="Y"THEN65
53 INPUT"{RVS}DRAW ANOTHER";M$
54 IFM$="Y"THENJ=J+4:GOTO10
55 END
56 FORX=0TO7:CT%(B)=PEEK(Z+X):IFPEEK(Z+X)
  =230THENC=VAL(A$(X))
57 IFPEEK(Z+X)=250THENC=0
58 D=D+C:POKEPC,D:B=B+1:NEXT:RETURN
59 PRINT"{CLR}":FORX=1TO18:PRINTLEFT$(P$,
  X)" "CR$:FORT=1TO75:NEXT:NEXT
60 FORX=1TO18:PRINTLEFT$(P$,19)LEFT$(P1$,
  X)"{DOWN}{LEFT} {DOWN}{LEFT} {2 UP}"CR
  $:FORT=1TO75:NEXT:NEXT
61 FORX=18TO1STEP-1:PRINTLEFT$(P$,X)LEFT$
  (P1$,18)CR$:FORT=1TO75:NEXT:NEXT
62 FORX=18TO1STEP-1:PRINTLEFT$(P$,1)LEFT$
  (P1$,X)CR$"{2 UP} {DOWN}{LEFT} ":FORT=
  1TO75:NEXT:NEXT
63 RETURN
64 B=0:PRINT"{CLR}"
65 B=0:PRINT"{CLR}"
66 FORQ=1TO8:FORX=1TO8:PRINT"{RVS}{BLU}"C
  HR$(CT%(B));:B=B+1:NEXT:PRINT:NEXT:PRI
  NT"{HOME}{DOWN}{8 RIGHT}";
67 FORQ=1TO8:FORX=1TO8:PRINT"{RVS}"CHR$(C
  T%(B));:B=B+1:NEXT:PRINT"{DOWN}
  {8 LEFT}";:NEXT:PRINT
68 PRINT"{UP}";:FORQ=1TO8:FORX=1TO8:PRINT
  "{RVS}"CHR$(CT%(B));:B=B+1:NEXT:PRINT:
  NEXT
69 PRINT"{8 UP}{8 RIGHT}";:FORQ=1TO8:FORX
  =1TO8
70 PRINT"{RVS}"CHR$(CT%(B));:B=B+1:NEXT:P
  RINT"{DOWN}{8 LEFT}";:NEXT:PC=PC-32:GO
  TO13
```

Program 2:

Character Printer And Screen Dump

```
1 PRINT"{CLR}"TAB(48)"{RED}PEEK AND PRINT
8 FORT=1TO2500:NEXT:DIMC%(3,8,8)
10 PC=7448:J=35:POKE36869,255
20 CR$=CHR$(J)+CHR$(J+1)+"{DOWN}{2 LEFT}"
  +CHR$(J+2)+CHR$(J+3)
30 PRINT"{CLR}{3 DOWN}{9 RIGHT}"CR$
40 PRINT"{3 DOWN}{RVS}"PC:FORA=1TO4:FORX=
  1TO8:PRINT"{RVS}"PEEK(PC);:PC=PC+1:NEX
  T:PRINT:NEXT
50 PRINT"{RVS}"PC-1
55 PRINT"{DOWN}":INPUT"{RVS}DESIGN NAME";
  DN$:GOSUB600:GOSUB60000
60 PRINT"{2 DOWN}":INPUT"{RVS}REVERSE: Y
  {SPACE}OR N";AN$
70 IFAN$="Y"THEN90
80 GOTO150
90 RC$=CHR$(J+1)+CHR$(J)+"{DOWN}{2 LEFT}"
  +CHR$(J+3)+CHR$(J+2)
99 PRINT"{CLR}{3 DOWN}{8 RIGHT}"CR$:PRINT
  "{3 DOWN}{RVS}"
100 L=7168:M=0:RC=PC-24:GOSUB200
110 RC=PC-32:GOSUB200
120 RC=PC-8:GOSUB200
130 RC=PC-16:GOSUB200
140 RC=PC-32:FORM=0TO32:POKERC+M,PEEK(L+M
  ):NEXT
150 PRINT"{HOME}"TAB(242)TAB(220);:INPUT"
  {RVS}DESIGN NAME";DN$:GOSUB600:GOSUB6
  0000
```

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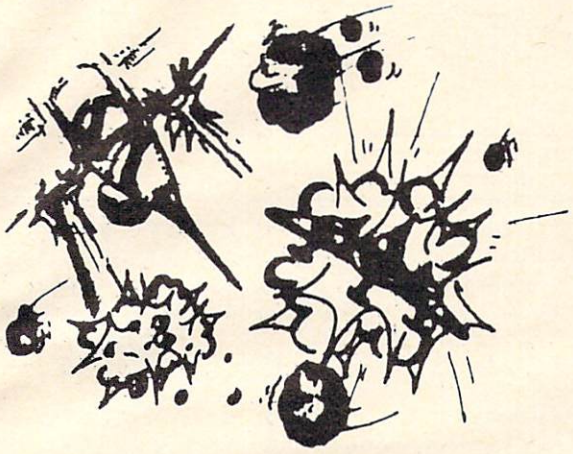

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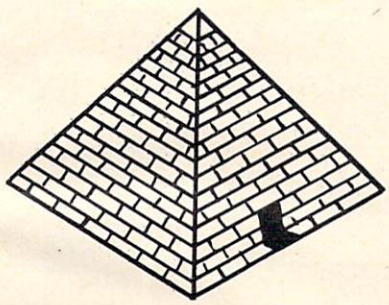

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```
155 PRINT"{HOME}"TAB(242)TAB(220)" {RVS}H
    IT RETURN TO GO ON"
160 GETA$:IFA$=""THEN160
170 J=J+4:GOTO20
180 END
200 FORR=RCTORC+7:X=PEEK(R):B=0:C=0
210 FORA=7TO0STEP-1:Y=INT(X/2↑A):IFY<=0TH
    ENZ=0:GOTO230
220 Z=2↑C
230 B=B+Z:C=C+1:IFZ=0THEN250
240 X=X-2↑A
250 NEXT:PRINT"{RVS}"B;:POKEL+M,B:M=M+1:N
    EXT:PRINT:RETURN
600 FORA=0TO3:FORB=0TO7:FORE=0TO7:C%(A,B,
    E)=0:NEXTE,B,A:DC=PC-32
605 FORA=0TO3:B=0:FORD=DCTODC+6:X=PEEK(D)
    :Y=0:FORE=7TO0STEP-1:Y=INT(X/2↑E):IFY
    <0THENY=0
608 IFY>0THENY=2
610 C%(A,B,E)=Y↑B:X=X-Y↑E:NEXT:B=B+1:NEXT
    :DC=DC+8:NEXT
620 FORA=0TO3:FORB=0TO6:FORE=7TO0STEP-1:C
    %(A,7,E)=C%(A,7,E)+C%(A,B,E):NEXTE,B,
    A:RETURN
60000 REM SCREEN COPY
60010 R$=CHR$(145):V$=CHR$(146):OPEN4,4:P
      RINT#4:G=PEEK(648)*256:PRINT#4,R$;:
      A=0:FORP=GTOG+505
60020 C=PEEK(P):C$="":IF(P-G)/22=INT((P-G
      )/22)THENPRINT#4,CHR$(8)+CHR$(13)+C
      HR$(14);
60021 IFA>3THEN60030
60022 IFC=32THEN60060
60025 FORE=7TO0STEP-1:IFC%(A,7,E)=0THENC$
      =C$+CHR$(C%(A,7,E):NEXT
60026 C$=C$+CHR$(C%(A,7,E)+128):NEXT:PRIN
      T#4,CHR$(8)C$;:A=A+1:NEXT
60030 IFC>128THENC=C-128
60040 IFC<32ORC>95THENC=C+64:GOTO60060
60050 IFC>63ANDC<96THENC=C+128:C$=""
60060 C$=C$+CHR$(C):IFLEN(C$)>1THENC$=C$+
      V$+R$
60070 PRINT#4,C$;:NEXT:PRINT#4:CLOSE4:RET
      URN
```

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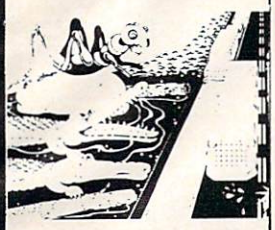

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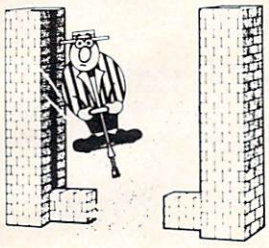

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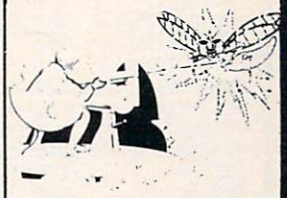

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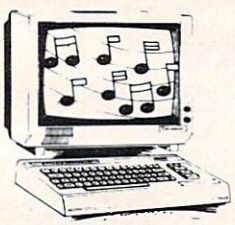

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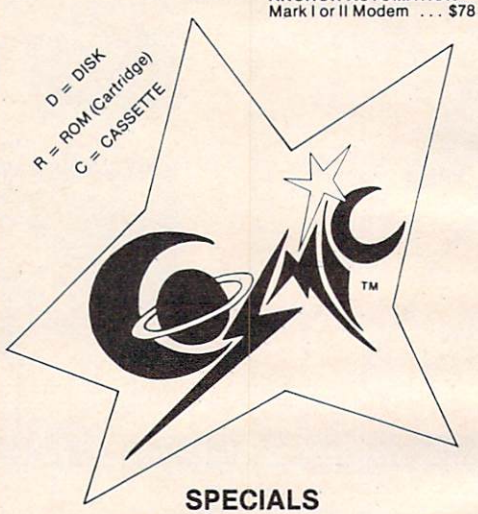

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High Octane Transfer For Atari

Steve Kaufman

Data storage and retrieval with disk files can be a slow process. Using Atari's unique string length capability, the author presents programming techniques which will read a file of 10,000 characters in 14 seconds.

The storage and retrieval of data is a relatively simple procedure on most microcomputer systems. Unfortunately, the speed of the process can leave a great deal to be desired.

The programs throughout this article will illustrate a method of achieving high-speed data transfer to disk. Let's start with Program 1, which will create a file of names and occupations.

Program 1: Names And Occupations File

```
10 DIM NAME$(30),OCC$(15)
20 OPEN #1,8,0,"D:NAMEOCCU.DAT"
30 ? "NAME (RETURN ONLY TO END)";:IN
   PUT NAME$
40 IF LEN(NAME$)=0 THEN CLOSE #1:END
50 ? "OCCUPATION";:INPUT OCC$
60 ? #1;NAME$;CHR$(155);OCC$
70 GOTO 30
```

This program is straightforward and simple, but simplicity does not imply efficiency. It does not cause disk access after every entry because DOS will write only to the disk when its sector buffer is full (every 125 bytes on single density drives, 253 on double density), but it does waste a lot of disk time in cases where a long file is being created.

Storing Data In Strings

More important, however, is the status of the data. Once a new name and occupation are entered, all the prior data is eliminated from RAM. It's on the disk, to be sure, but it becomes a rather tedious process to retrieve and modify it. A far better procedure, in terms of both disk access time and data manipulation flexibility, is to store all the data, as it is generated, in a single long string as demonstrated in Program 2.

Program 2: String Storage Of Data

```
10 DIM NAME$(20),OCC$(15),A$(10000)
20 ? "NAME (RETURN ONLY TO END)";:IN
   PUT NAME$
30 IF LEN(NAME$)=0 THEN GOTO 100
40 ? "OCCUPATION";:INPUT OCC$
50 REM now pad the data with spaces
   so that each entry is the same le
   ngth
60 IF LEN(NAME$)<20 THEN NAME$(LEN(N
   AME$)+1)=" ":GOTO 60
70 IF LEN(OCC$)<15 THEN OCC$(LEN(OCC
   $)+1)=" ":GOTO 70
80 A$(LEN(A$)+1)=NAME$:A$(LEN(A$)+1)
   =OCC$
90 GOTO 20
100 FOR X=0 TO LEN(A$)/35-1
110 PRINT A$(X*35+1,X*35+20);"
    {4 SPACES}";A$(X*35+21,X*35+35)
120 NEXT X
```

In this example, though we've wasted what may turn out to be a substantial amount of space by padding the data fields with blanks (lines 60-70) so that they're all the same length, the padding creates a series of easily accessed records that can be edited or (as in lines 100-120) printed out in a formatted fashion without any difficulty. Equally significant is the speed with which the entire file of data can be sent to the disk (or cassette):

```
200 OPEN #1,8,0,"D:NAMEOCCU.DAT"
210 PRINT #1;A$:CLOSE #1
```

In addition, in this instance, even after you have sent the file to the disk, it is still sitting in RAM (in A$) where it can be manipulated further. You could also combine the two methods, writing each field of data to the disk and putting it into the long string A$ at the same time.

Note that Atari BASIC provides you with a substantial speed advantage in disk time here over most other microcomputer BASICs inasmuch as it allows strings to be up to 32K long. In other BASICs (for example, Microsoft BASIC on the Atari), the file would have to be saved in an array of strings (or in this case perhaps in two arrays,

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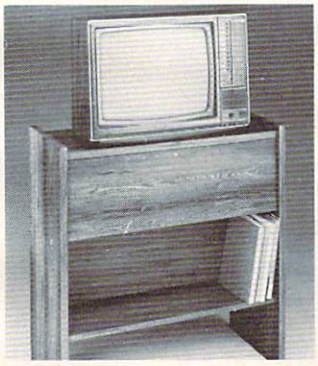

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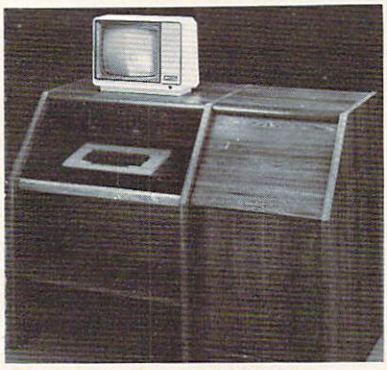

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NAME$( ), and OCC$( )), and the save to the disk would have to be done in a significantly slower FOR/NEXT loop:

```
10 FOR X=1 TO ARRAYSIZE
20 PRINT #1,NAME$(X)
30 PRINT #1,OCC$(X)
40 NEXT X
```

Data Retrieval By INPUT

While creating and writing data files is a relatively straightforward procedure, reading the files is by no means as simple, or, in many cases, as rapid. The easiest way in BASIC to read such files is to use the INPUT statement. This would work very well on the data file created in Program 1. Indeed it is a simple matter to read in the data, pad each field with blanks, and put it all into a long string as in Program 3.

Program 3: Reading Data With INPUT

```
10 DIM NAME$(20),OCC$(15),A$(10000)
20 OPEN #1,4,0,"D:NAMEOCCU.DAT"
30 TRAP 200
40 INPUT #1,NAME$:INPUT #1,OCC$
50 IF LEN(NAME$)<20 THEN NAME$(LEN(N
   AME$)+1)=" ":GOTO 50
60 IF LEN(OCC$)<15 THEN OCC$(LEN(OCC
   $)+1)=" ":GOTO 60
70 A$(LEN(A$)+1)=NAME$:A$(LEN(A$)+1)
   =OCC$:GOTO 40
200 CLOSE #1
```

INPUT in Atari BASIC is relatively problem-free. Unlike most BASICs, you can use it easily even if the data contains commas or colons which would signal end of field to the INPUT statement of other BASICs (that is, it really works more like the LINPUT/LINE INPUT available in some dialects).

The problem with the INPUT statement is that it can be used only when there is a carriage return character (ATASCII 155) in the file after every line of text. The file created by Program 1 has such carriage returns embedded in it automatically because every PRINT statement (not followed by a semicolon or comma) automatically attaches a carriage return to the data. This is the reason we had to embed a CHR$(155) in our data in line 60 of Program 1. Alternatively, we could have written ?#1;NAME$:?#1;OCC$.

In Program 2 we do not have carriage returns embedded in the data. The normal way to retrieve such files in BASIC is to use the GET statement, which retrieves one character at a time:

```
10 DIM A$(10000)
20 OPEN #1,4,0,"D:NAMEOCCU.DAT"
30 TRAP 200 :REM to catch the "end o
   f file" error
40 GET #1,X:A$(LEN(A$)+1)=CHR$(X):GO
   TO40
200 CLOSE #1
```

The problem with this procedure is that it is inordinately slow, much slower than using INPUT, and INPUT itself doesn't even come close to the speed of data access that the disk drive is capable of providing. In this particular case we could revise Program 2 by inserting a CHR$(155) after every field in the storage string A$, then we could use INPUT to retrieve it.

Reading Files Of Unknown Length

There are many kinds of data in which carriage return characters might not only be inappropriate but also might be found within data fields themselves, so that INPUT could not be used. Reading in a segment of machine language or the data for a graphics display would be two common examples. Some computers provide an easy way to directly and quickly store and retrieve chunks of RAM memory, such as the commands BSAVE and BLOAD in Applesoft.

Experienced users realize that the Atari operating system supports such operations, but even with them, the user must declare in advance the exact length of the file to be transferred.

The challenge is to find a simple routine that will read a file from disk into memory at maximum speed, even though we don't know in advance how long the file is. Simply knowing that we have reached end-of-file is not enough. Let us say, for example, that we have provided a 10,000-character block of memory (DIM A$(10000)) in which to store our file. How do we know how far into that memory block the file has reached? No problem. It turns out that the operating system keeps track for us, in RAM locations 40 and 41, of exactly how many bytes are transferred during a Central Input/Output (CIO) operation.

The following routine, then, can be ENTERed into any BASIC program to initialize a string (FAST$) containing machine language which allows us optimum-speed file access:

```
30000 RESTORE 30001:FOR I=1 TO 39:RE
      AD A:FAST$(LEN(FAST$)+1)=CHR$(
      A):NEXT I:GOTO 10
30001 DATA 104,104,104,10,10,10,10,1
      70,169,7,157,66,3,104,157,69,3
      ,104,157,68,3,104,157,73,3
30002 DATA 104,157,72,3,32,86,228,13
      2,212,160,0,132,213,96
```

In order to use this routine, you need only open the file normally in BASIC and do a USR function call:

Y=USR(ADR(FAST$),CHANNEL,ADR(A$),BSIZE)

where Y is the status returned by the CIO call, CHANNEL is the channel number that you have assigned to this file in your OPEN statement, A$ is the buffer string into which the file will be read, and BSIZE is the maximum length of that buffer (normally the value to which you have DIMensioned A$). Using this procedure on a file of 10,000 characters, it takes only 14 seconds (9 if you have double density) to read the file into RAM. This is

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as fast as the drive is capable of reading. Using INPUT, where possible, takes about 42 seconds to transfer the same number of bytes. Using GET to perform this function takes 2½ minutes.

Program 4 is a simple BASIC program using this function that allows you to read any file off disk and print it on the screen. Note that if the USR call returns a status of 136, the end-of-file has been reached. If the status is 1, the file is longer than the buffer you have provided. Any other status indicates an error situation.

This routine can also be used for saving data directly from RAM to a disk file. Simply substitute the value 11 (the binary PUT command value) for the value 7 in the DATA statements or in FAST$ after it has been initialized (FAST$(10,10) = CHR$(11)). Using such a modified FAST$, the following routines will save an entire GRAPHICS 0 screen to disk:

```
10 OPEN #1,8,0,"D:GR0.DAT"
20 START=PEEK(88)+256*PEEK(89)
30 Y=USR(ADR(FAST$),1,START,40*24)
40 CLOSE #1: IF Y<>1 THEN PRINT "ERR
   OR ";Y
```

Change FAST$(10,10) back to CHR$(7), and you can put the data right back on the screen just as quickly:

```
10 OPEN #1,4,0,"D:GR0.DAT"
20 START=PEEK(88)+256*PEEK(89)
30 Y=USR(ADR(FAST$),1,START,40*24)
40 CLOSE #1
```

Program 4: Data Retrieval By A USR Call

```
0 BSIZE=10000:DIM FAST$(39),A$(BSIZE
  ),FNAME$(15)
5 A$(1)="{,}":A$(BSIZE)="{,}":A$(2)=
  A$(1):Z=0:GOTO 30000
10 ? "NAME OF FILE TO READ";:INPUT F
   NAME$
100 OPEN #1,4,0,FNAME$
110 Y=USR(ADR(FAST$),1,ADR(A$),BSIZE
    )
115 Z=PEEK(40)+256*PEEK(41)
116 REM Y is the error status, Z is
    the number of bytes read from th
    e file
119 REM now tell BASIC how long our
    storage string is
120 A$(Z)=A$(Z,Z)
125 IF Y=136 THEN ? A$:? "END OF FIL
    E":END
130 IF Y=1 THEN ? A$:? "RETURNING TO
     GET REMAINDER OF FILE":GOTO 110
139 REM any other value of Y is a di
    sk error.
140 ? "ERROR #";Y:END
30000 RESTORE 30001:FOR I=1 TO 39:RE
      AD A:FAST$(LEN(FAST$)+1)=CHR$(
      A):NEXT I:GOTO 10
30001 DATA 104,104,104,10,10,10,10,1
      70,169,7,157,66,3,104,157,69,3
      ,104,157,68,3,104,157,73,3
30002 DATA 104,157,72,3,32,86,228,13
      2,212,160,0,132,213,96
```


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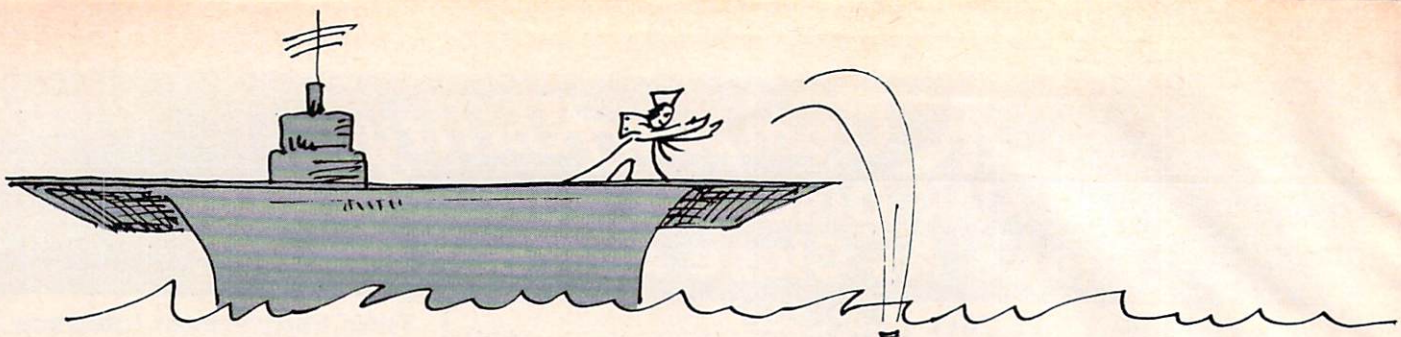


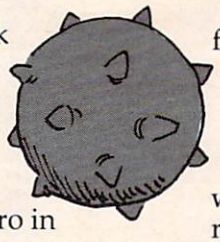
U-boat

Mark Vittek

"U-boat," for VIC and 64, starts out quietly enough, but don't be lulled into a false sense of security. Without warning, you'll be called upon to use all your wits to save yourself.

"U-boat" is a nice change of pace from fast action, run-and-shoot games – for a while.

As you calmly patrol the ocean floor, the serenity is soon broken by the sudden explosion of a depth charge. Above you, on the ocean surface, are destroyers on a search-and-destroy mission. And if that isn't bad enough, there is a constant supply of mines to keep you busy.



The object of the game is to sink as many ships as possible before their depth charges reach you. On the surface of the sea, destroyers and aircraft carriers pass to and fro dropping their destructive cargo. Some drop randomly, but others zero in on your U-boat.

You can destroy bothersome mines with your torpedoes, but new ones always replace them after five ships have been sunk. So in order to keep your patrol area tidy, you have to take time out every now and then to remove mines. Also, it's important to remember that when the charges and mines explode, they take the surrounding eight cursor spaces with them. If your U-boat is in this area, it is permanently retired.

VIC Version

For those of you who do not have a joystick, Program 3 shows the necessary replacement lines for Program 2 so that you can use the keyboard. I used the cursor keys to move the sub, but if you find that they are too difficult, you may assign new keys in lines 70-76.

If you do have a joystick, you may want to try the keyboard later on. You'll find it more of a challenge because the game plays faster. It may be a bit difficult at first, but if you master the game using the keyboard, you can become the scourge of the seven seas.

U-boat was designed to provide a large variety of objects on the screen without slowing the game down. As most game programmers know, too many POKEs and PRINTs can spoil the game's fast action quality. For example, the usual two POKEs to location 37154 have been omitted from the joystick reading routine.

Using MID$ is a good technique for achieving fast movement of many objects on screen. In Program 2, MID$ was used to move the ships across the screen because it was faster than POKEing. Also, when I first wrote the game with POKEs, the ship's bow plunged into the sea as the ship wrapped around the screen. This could be remedied with IF statements, but using MID$ turned out to be faster and easier. Since the number of characters displayed by MID$ is set at 22 (VIC's screen width), the ship disappears as if it just sailed out of view.

LEFT$, RIGHT$, and MID$ often provide for faster and more clever effects in game programming.

Type in and SAVE Program 1 first. This program will print instructions and redefine the necessary game characters. Reset the computer, then type in and SAVE Program 2 immediately following Program 1 on the same tape. When you RUN Program 1, it will automatically LOAD and RUN Program 2.

The 64 version plays the same as the VIC version but requires a joystick.

Janice Fary

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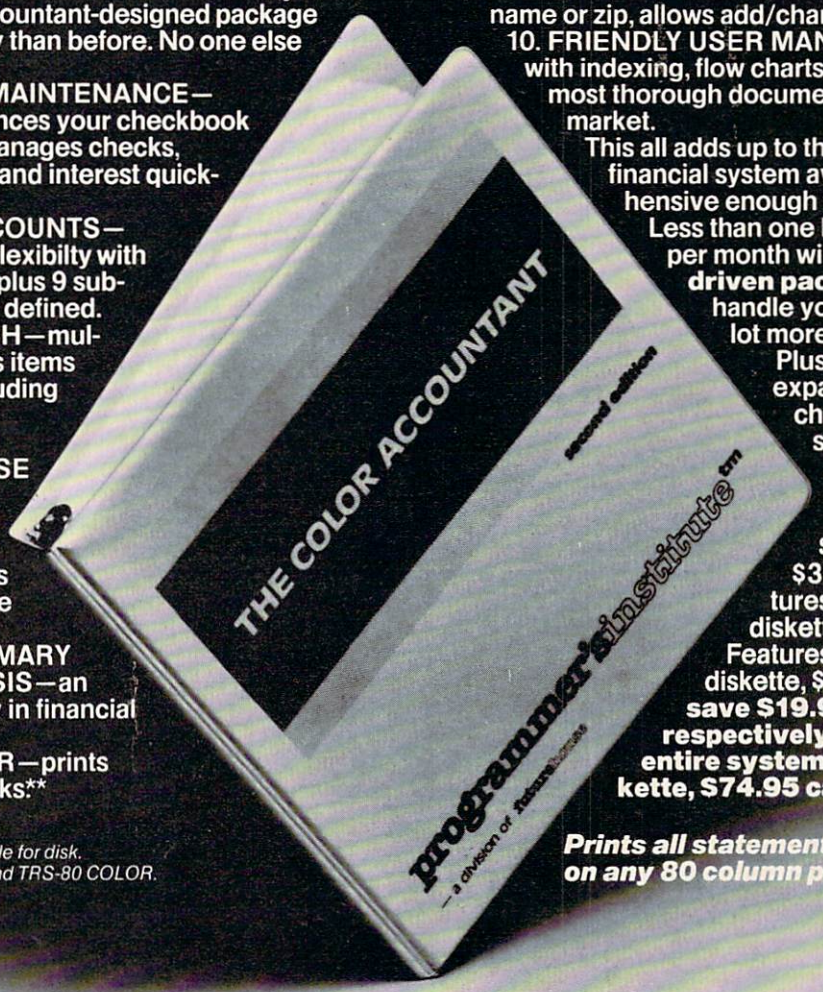

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Program 1: U-boat – VIC Version (Instructions And Loader)

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."

```
5 PRINT "{CLR}{6 DOWN}{BLU}{RVS}
  {8 SPACES}U-BOAT{8 SPACES}"
10 X=28:POKE52,X:POKE56,X:POKE51,PEEK(55)
20 FORI=7168TO7679:POKEI,PEEK(I+25600):NE
   XT
30 READT:IFT=-1THEN50
40 POKE7168+Q,T:Q=Q+1:POKE36879,T:GOTO30
50 POKE36879,28:PRINT"{3 DOWN} INSTRUCTIO
   NS? (Y/N)"
55 FORT=1TO1000:GETA$:IFA$="N"THENT=1000
60 IFA$="Y"THENT=1000:NEXT:GOTO100
65 NEXT:GOTO150
100 PRINT"{CLR}{DOWN} FIRE TORPEDOES FROM
    {3 SPACES}THE SUB'S FRONT{2 SPACES}TO
    {3 SPACES}SINK SHIPS AND "
105 PRINT" DESTROY MINES."
110 PRINT"{DOWN} BEWARE OF THE DEPTH
    {3 SPACES}CHARGES AND MINES{5 SPACES}
    DESTRUCTIVE AREA "
115 PRINT" WHEN THEY EXPLODE."
120 PRINT"{DOWN} DESTROY AS MANY SHIPS AS
     YOU CAN UNTIL YOU{2 SPACES}ARE PERMA
    NENTLY{7 SPACES}RETIRED."
125 FORT=1TO5000:NEXT:PRINT"{3 DOWN}{RVS}
     PRESS ANY KEY "
130 GETA$:IFA$=""THEN130
140 REM THE NEXT LINE{2 SPACES}WILL NEW T
    HE PROGRAM. DO NOT PUT IT IN WHEN TES
    TING{2 SPACES}PROGRAM.
150 PRINT"{CLR}":POKE198,5:FORT=631TO635:
    READX:POKET,X:NEXT
1000 DATA182,193,213,128,201,193,182,255,
     255,159,159,159,243,243,243,255,,,,,
     255,101,63
1002 DATA31,,96,112,252,255,148,255,255,,
     14,30,127,255,145,255,255,,,,,255,16
     6,252,248
1004 DATA,,4,4,15,10,127,63,,192,196,200,
     208,224,255,254
1006 DATA,3,35,19,11,7,255,127,,,32,32,24
     0,80,254,252,254,254,252,252,,133,20
     8,224
1008 DATA255,255,127,63,,80,3,31,255,255,
     254,254,,10,192,248
1010 DATA127,127,63,63,,161,11,7,255,239,
     239,239,239,199,215,255,65,41,68,175
     ,122,189
1012 DATA110,219,17,74,148,125,218,180,22
     1,182,255,255,255,255,255,255,255,25
     5
1014 DATA191,213,187,92,171,237,190,219,2
     47,174,181,125,235,189,173,222
1016 DATA-1,78,69,87,13,131
```

Program 2: U-boat – VIC Version (Main Program)

```
0 GOTO600
50 PA=PEEK(37152)AND128:P=PEEK(37151):IF-
   ((PAND32)=0)ORLTHENGOSUB150
70 IF-(PA=0)THENAY=AY+1:X=12:IFAY>20THENA
   Y=AY-1
72 IF-((PAND16)=0)THENAY=AY-1:X=10:IFAY<0
   THENAY=AY+1
74 IF-((PAND8)=0)THENAX=AX+22:IFAX>198THE
   NAX=AX-22
76 IF-((PAND4)=0)THENAX=AX-22:IFAX<-22THE
   NAX=AX+22
80 A=AX+AY+7900:P=PEEK(A):P0=PEEK(A+1):PO
   KEA1,17:POKEA1+1,17:POKEA,X:POKEA+1,X+
   1:A1=A
82 IFP<20RP0<2THEN400
84 LM=LM+1:IFLM<RRTHEN92
86 N1=N1+22:CO=PEEK(N1):IFN1=AORN1=A+1THE
   NPOKEN1-22,17:GOTO400
88 IFN1>AORCO<3THEN300
90 POKEN1-22,17:POKEN1,1
92 IFM>VTHEN:PRINT"{HOME}{BLK}{7 DOWN}"MI
   D$(A$(TT),H,22);:H=H+M2:IFH=H1THENM=0:
   H=1
94 M=M+1:IFM<VTHEN50
96 IFM=VTHEN100
98 GOTO50
100 LM=0:N1=7856+AY:T=(RND(1)*6)+1:ONTGOT
    O110,108,106,104
102 TT=(RND(1)*2)+1:H=2:H1=26:M2=1:RR=22-
    (LM+AY):GOTO94
104 TT=(RND(1)*2)+3:H=26:H1=2:M2=-2:RR=-(
    LM-AY)/2:GOTO94
106 TT=(RND(1)*2)+3:H=28:H1=2:M2=-2:T=RND
    (1)*19:N1=7858+T:RR=3-(LM-T)/2:GOTO94
108 TT=4:H=28:H1=2:M2=-1:T=RND(1)*19:N1=7
    858+T:RR=3-(LM-T):GOTO94
110 TT=2:H=2:H1=26:M2=1:T=RND(1)*20:N1=78
    56+T:RR=22-(LM+T):GOTO94
150 L=L+1:IFL<2THENC=A:IFX=12THENC=A+1
152 C=C-22:CO=PEEK(C):IFCO<17THEN160
154 IFC<7856THENPOKEC+22,17:L=0:RETURN
156 POKEC+22,17:POKEC,14:RETURN
160 ONCO+1GOTO162,162:GOTO180
162 POKEZZ-2,(RND(1)*50)+155:FORT=-1TO1:F
    ORI=-1TO1:POKEZZ-1,10-T-I:C1=PEEK(C+I
    +T*22)
164 IFC1=1THENRR=99:LM=0
168 IFC1>9ANDC1<14THENM1=1
169 L=0:POKEC+I+T*22,(RND(1)*2)+18:NEXTI,
    T:POKEZZ-2,0:IFM1=1THEN400
170 FORT=-1TO1:FORI=-1TO1:POKEC+I+T*22,17
    :NEXTI,T:RETURN
180 PRINT"{HOME}{PUR}{7 DOWN}"MID$(A$(0),
    H,22):POKEC+22,17:POKEC-22,32:POKEZZ-
    2,(RND(1)*100)+140
182 FORT=15TO0STEP-.09:POKEZZ-1,T:NEXT:PR
    INT"{HOME}{7 DOWN}{22 SPACES}";
184 M=0:L=0:IFCO<7THENBS=BS+1
186 IFCO>6THENMS=MS+1
188 IFLM<RRTHENRR=99
190 IFMS+BS=5THENPOKEZZ,248:V=20
192 IFMS+BS=15THENPOKEZZ,232:V=10
194 IFMS+BS=30THENPOKEZZ,204
196 IF(MS+BS)/5=INT((MS+BS)/5)THENFORT=1T
    O8:POKE7878+(RND(1)*197),0:NEXT:J=1
198 IFJ=1THENFORT=-1TO2:FORI=-1TO1:POKEA+
    T+I*22,17:NEXTI,T:J=0
200 RETURN
300 J=15:RR=99:ML=0:POKEZZ-2,(RND(1)*30)+
    128:FORT=-1TO1:FORI=-1TO1:C1=PEEK(N1+
    I+T*22)
302 POKEZZ-1,J:J=J-1.6:IFC1=14THENL=0
304 IFC1>9ANDC1<14THENM1=1
306 POKEN1+I+T*22,(RND(1)*2)+18:NEXTI,T:P
    OKEZZ-2,0:IFM1=1THEN400
```

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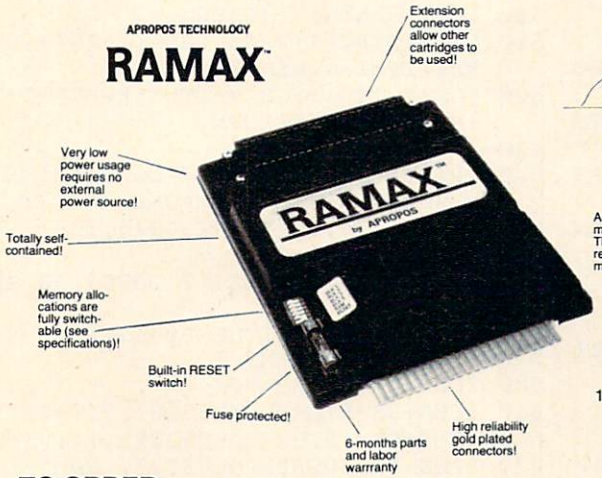

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```
308 FORT=-1TO1:FORI=-1TO1:POKEN1+I+T*22,1
    7:NEXTI,T:GOTO92
309 POKEN1+I+T*22,(RND(1)*2)+18:NEXTI,T:P
    OKEZZ-2,0:IFM1=1THEN400
400 POKEZZ-1,15:POKEA,15:POKEA+1,16
402 FORT=1TO16STEP.15:POKEZZ-2,255-T*5:PO
    KEZZ,T*11:NEXT:POKEZZ-5,0
404 FORT=15TO0STEP-.2:POKEA,(RND(1)*2)+18
    :POKEA+1,(RND(1)*2)+18
406 POKEZZ-1,T:NEXT:POKEZZ-2,0:POKEZZ-10,
    240:POKEZZ,221:PRINT"{CLR}{BLK}{DOWN}
     YOU SANK"BS"CARRIERS"
408 PRINT"{DOWN}AND"MS"DESTROYERS":FORT=1
    TO2000:NEXT
410 PRINT"{3 DOWN} PLAY AGAIN ?":PRINT"
    {RVS}{DOWN} UP=YES DOWN=NO"
412 IF-((PEEK(37151)AND4)=0)THENRUN
414 IF-((PEEK(37151)AND8)=0)THENPOKE37154
    ,255:PRINT"{CLR} SO LONG.":END
416 GOTO412
600 ZZ=36879:POKEZZ,24:POKEZZ-10,255:POKE
    ZZ-1,15:POKE37154,127:X=10:V=30:AX=19
    8:AY=10
602 RR=30:H=2:PRINT"{CLR}{BLK}{RVS}
    {5 SPACES}U-BOAT{2 SPACES}26
    {7 SPACES}{OFF}"CHR$(8);
604 A$(1)="{21 SPACES}BDE{3 SPACES}":A$(2
    )="{21 SPACES}FG{3 SPACES}"
606 A$(3)="{25 SPACES}BCDE ":A$(4)="
    {25 SPACES}HI "
608 A$(0)="{22 SPACES}OPOP "
610 FORT=1TO4:PRINT"{YEL}QQQQQQQQQQQQQQQQ
    QQQQQQ";:NEXT:PRINT"{3 DOWN}";:FORT=1
    TO12
612 PRINT"{BLU}QQQQQQQQQQQQQQQQQQQQQQ";:N
    EXT
614 FORT=8120TO8186:POKET,17:POKE30720+T,
    0:NEXT:FORT=1TO15:POKE7878+(RND(1)*19
    7),0
618 NEXT:POKE8108,17:POKE8109,17:GOTO50
```

Program 3: U-boat – VIC Version (Replacement Lines For Keyboard Control)

```
50 GETA$:IFA$=" "ORLTHENGOSUB150
70 IFA$="{RIGHT}"THENAY=AY+1:X=12:IFAY>20
   THENAY=AY-1
72 IFA$="{LEFT}"THENAY=AY-1:X=10:IFAY<0TH
   ENAY=AY+1
74 IFA$="{DOWN}"THENAX=AX+22:IFAX>198THEN
   AX=AX-22
76 IFA$="{UP}"THENAX=AX-22:IFAX<-22THENAX
   =AX+22
```

Program 4: U-boat – 64 Version

```
100 POKE55,0:POKE56,48:CLR:PRINT"{CLR}"CH
    R$(8):GOTO880
110 :
120 FORI=0TO27:POKEI+54272,0:NEXT
130 POKE54296,15:POKE54272,100:POKE54273,
    5:POKE54277,0:POKE54278,249
140 POKE54279,100:POKE54280,2:POKE54284,0
    :POKE54285,249
150 POKE54291,0:POKE54292,249:M=V:GOTO340
160 :
170 MV=1:P=PEEK(56320):IFP=127THENMV=0
180 IF(PAND16)=0ORLTHENGOSUB420
190 IF(PAND8)=0THENAY=AY+1:X=12:IFAY>38TH
    ENAY=AY-1
200 IF(PAND4)=0THENAY=AY-1:X=10:IFAY<0THE
    NAY=AY+1
210 IF(PAND2)=0THENAX=AX+40:IFAX>360THENA
    X=AX-40
220 IF(PAND1)=0THENAX=AX-40:IFAX<-80THENA
    X=AX+40
230 A=AX+AY+1424:P=PEEK(A):P0=PEEK(A+1):I
    FMVTHENPOKEA1,17:POKEA1+1,17
240 POKEA,X:POKEA+1,X+1:A1=A
250 IFP<2ORP0<2THEN760
260 LM=LM+1:IFLM<RRTHEN300
270 N1=N1+40:CO=PEEK(N1):IFN1=AORN1=A+1TH
    ENPOKEN1-40,17:GOTO760
280 IFN1>AORCO<3THEN680
290 POKEN1-40,17:POKEN1,1
300 IFM>VTHENPRINT"{HOME}{BLK}{7 DOWN}"MI
    D$(A$(TT),H,40);:H=H+M2:IFH=H1THENM=0
    :H=1
310 M=M+1:IFM=VTHEN340
320 GOTO170
330 :
340 LM=0:N1=1344+AY:T=RND(1)*6+1:ONTGOTO3
    90,380,370,360
350 TT=RND(1)*2+1:H=2:H1=44:M2=1:RR=40-(L
    M+AY):GOTO310
360 TT=RND(1)*2+3:H=44:H1=2:M2=-2:RR=-(LM
    -AY)/2:GOTO310
370 TT=RND(1)*2+3:H=46:H1=2:M2=-2:T=RND(1
    )*37:N1=1344+T:RR=3-(LM-T)/2:GOTO310
380 TT=4:H=46:H1=2:M2=-1:T=RND(1)*37:N1=1
    344+T:RR=3-(LM-T):GOTO310
390 TT=2:H=2:H1=44:M2=1:T=RND(1)*38:N1=13
    44+T:RR=40-(LM+T):GOTO310
400 :
410 REM TORP MOVE
420 L=L+1:IFL<2THENC=A:IFX=12THENC=A+1
430 C=C-40:CO=PEEK(C):IFCO<17THEN460
440 POKEC+40,17:IFC<1344THENL=0:RETURN
450 POKEC,14:RETURN
460 IFCO<>0ANDCO<>1THEN540
470 POKE54276,129:POKE54276,128
480 FORT=-1TO1:FORI=-1TO1:C1=PEEK(C+I+T*4
    0)
490 IFC1=1THENRR=99:LM=0
500 IFC1>9ANDC1<14THENM1=1
510 L=0:POKEC+I+T*40,(RND(1)*2)+18:NEXT:N
    EXT:IFM1=1THEN760
520 FORT=-1TO1:FORI=-1TO1:POKEC+I+T*40,17
    :NEXT:NEXT:RETURN
530 :
540 PRINT"{HOME}{PUR}{7 DOWN}"MID$(A$(0),
    H,40):POKEC+40,17:POKEC-40,32
550 POKE54276,129:POKE54276,128
560 FORT=1TO100:NEXT
570 PRINT"{WHT}{HOME}{7 DOWN}{40 SPACES}"
    ;
580 M=0:L=0:IFCO<7THENBS=BS+1
590 IFCO>6THENMS=MS+1
600 IFLM<RRTHENRR=99
610 IFMS+BS=5THENPOKE53281,7:V=20
620 IFMS+BS=15THENPOKE53281,14:V=10
630 IFMS+BS=30THENPOKE53281,10
640 IF(MS+BS)/5=INT((MS+BS)/5)THENFORT=1T
    O8:POKE1384+(RND(1)*359),0:NEXT:J=1
650 IFJ=1THENFORT=-1TO2:FORI=-1TO1:POKEA+
    T+I*40,17:NEXT:NEXT:J=0
660 RETURN
670 :
680 RR=99:ML=0:POKE54283,129:POKE54283,12
    8
690 FORT=-1TO1:FORI=-1TO1:C1=PEEK(N1+I+T*
    40)
```

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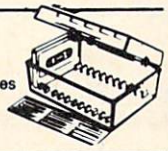

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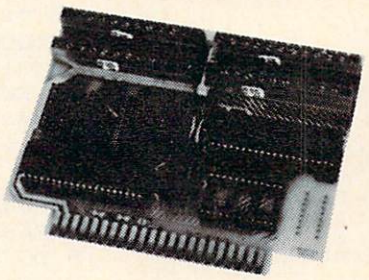

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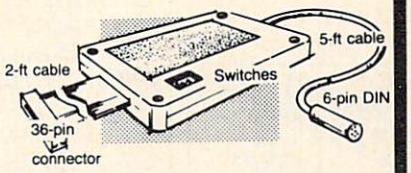

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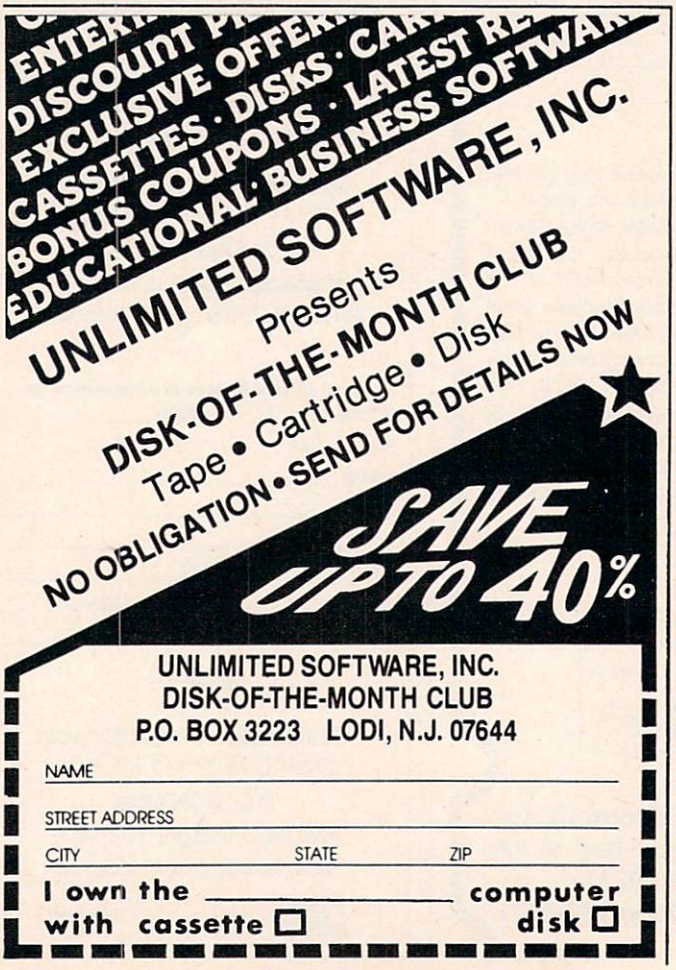
```
700 IFC1=14THENL=0
710 IFC1>9ANDC1<14THENM1=1
720 POKEN1+I+T*40,(RND(1)*2)+18:NEXT:NEXT
    :IFM1=1THEN760
730 FORT=-1TO1:FORI=-1TO1:POKEN1+I+T*40,1
    7:NEXT:NEXT:GOTO300
740 :
750 REM SUB DEATH
760 POKEA,15:POKEA+1,16:POKE54286,0:POKE5
    4290,129
770 FORT=230TO255STEP.15:POKE54287,255-T:
    POKE53281,15ANDT:NEXT:POKE54290,128
780 FORT=1TO50:POKEA,(RND(1)*2)+18:POKEA+
    1,(RND(1)*2)+18
790 NEXT:POKE53272,21:POKE53280,0:POKE532
    81,5
800 PRINT"{CLR}{BLK}{3 DOWN}"SPC(9)"YOU S
    ANK"BS"CARRIER";CHR$(-83*(BS<>1))
810 PRINT SPC(10)"{2 DOWN}AND"MS"DESTROYE
    R";CHR$(-83*(MS<>1))
820 PRINTSPC(6)"{5 DOWN}PRESS TRIGGER TO
    {SPACE}PLAY AGAIN":I=0
830 IF(PEEK(56320)AND16)=0THENRUN890
840 I=I+1:IFI>1000THENPRINT"{CLR}";:END
850 GOTO830
860 :
870 REM INIT
880 GOSUB1060
890 PRINT"{CLR}":POKE53280,0:POKE53281,1
900 POKE53272,28:POKE54296,15:ZZ=80000
910 X=10:V=30:AX=360:AY=20:RR=30:H=2
920 PRINTSPC(13)"{BLK}{RVS}{2 SPACES}U-BO
    AT{2 SPACES}26{2 SPACES}"
930 A$(1)="{39 SPACES}BDE{3 SPACES}"
940 A$(2)="{39 SPACES}FG{3 SPACES}"
950 A$(3)="{43 SPACES}BCDE "
960 A$(4)="{43 SPACES}HI "
970 A$(0)="{40 SPACES}OPOP "
980 FORT=1TO4:PRINT"{YEL}QQQQQQQQQQQQQQQQ
    QQQQQQQQQQQQQQQQQQQQQQQQQQ";:NEXT
990 PRINT"{DOWN}"
1000 FORT=1TO12:PRINT"{BLU}QQQQQQQQQQQQQQ
    QQQQQQQQQQQQQQQQQQQQQQQQQQ";:NEXT
1010 FORT=1824TO2023:POKET,17:POKE54272+T
    ,0:NEXT
1020 FORT=1TO15:POKE1384+RND(1)*359,0:NEXT
1030 POKE1794,17:POKE1795,17:GOTO120
1040 :
1050 REM CHARSET
1060 POKE53280,0:POKE53281,4:PRINT"{CLR}
    {6 DOWN}{BLU}"SPC(13)"{RVS}
    {2 SPACES}U-BOAT 26{2 SPACES}"
1070 PRINTSPC(10)"{3 DOWN}ONE MOMENT PL
    EASE"
1080 FORI=0TO58:READA:POKE49152+I,A:NEXT:
    SYS49152
1090 READT:IFT=-1THE?N1130
1100 POKE12288+Q,T:Q=Q+1:GOTO1090
1110 :
1120 REM INSTRUCTIONS
1130 PRINT"{CLR}{3 DOWN} FIRE TORPEDOES F
    ROM THE SUB'S FRONT"
1140 PRINT"{3 SPACES}TO SINK SHIPS AND DE
    STROY MINES."
1150 PRINT"{3 DOWN} BEWARE OF THE DESTRUC
    TIVE AREA WHEN"
1160 PRINT"{4 SPACES}MINES AND DEPTH CHAR
    GES EXPLODE."
1170 PRINT"{3 DOWN}{3 SPACES}DESTROY AS M
    ANY SHIPS AS YOU CAN"
1180 PRINT" BEFORE YOU ARE PERMANENTLY RE
    TIRED."
1190 PRINTSPC(12)"{4 DOWN}{RVS} PRESS
    {2 SPACES}TRIGGER ":POKE198,0
1200 IFPEEK(56320)AND16THEN1200
1210 RETURN
1220 :
1230 DATA 173,14,220,41,254,141,14,220,16
    5,1,41,251,133,1,169
1240 DATA 48,133,252,169,208,133,254,169,
    0,133,251,133,253
1250 DATA 162,8,177,253,145,251,200,208,2
    49,230,254,230,252
1260 DATA 202,208,242,165,1,9,4,133,1,173
    ,14,220,9,1,141,14,220,96
1270 :
1280 DATA 182,193,213,128,201,193,182,255
1290 DATA 255,159,159,159,243,243,243,255
1300 DATA 0,0,0,0,255,101,63,31
1310 DATA 0,96,112,252,255,148,255,255
1320 DATA 0,14,30,127,255,145,255,255
1330 DATA 0,0,0,0,255,166,252,248
1340 DATA 0,0,4,4,15,10,127,63
1350 DATA 0,192,196,200,208,224,255,254
1360 DATA 0,3,35,19,11,7,255,127
1370 DATA 0,0,32,32,240,80,254,252
1380 DATA 254,254,252,252,0,133,208,224
1390 DATA 255,255,127,63,0,80,3,31
1400 DATA 255,255,254,254,0,10,192,248
1410 DATA 127,127,63,63,0,161,11,7
1420 DATA 255,239,239,239,239,199,215,255
1430 DATA 65,41,68,175,122,189,110,219
1440 DATA 17,74,148,125,218,180,221,182
1450 DATA 255,255,255,255,255,255,255,255
1460 DATA 191,213,187,92,171,237,190,219
1470 DATA 247,174,181,125,235,189,173,222
1480 DATA-1
```

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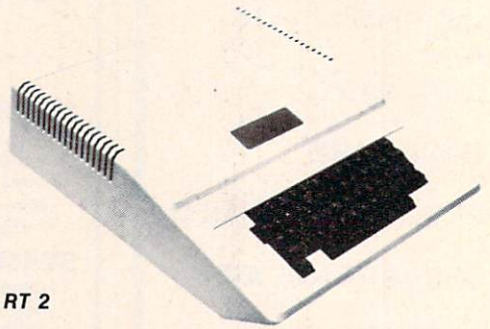

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NEWS&PRODUCTS

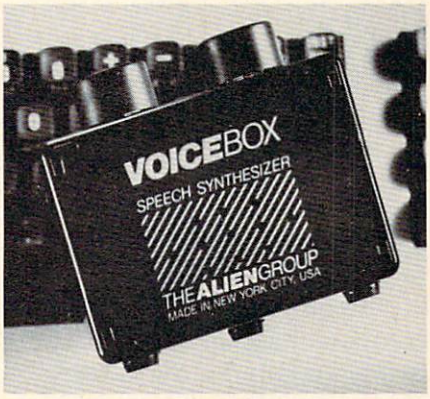
Singing Speech Synthesizer

The Alien Group has made its Voicebox Speech Synthesizer available for the VIC and Commodore 64.

The Voicebox plugs directly into the user port, includes its own speaker, volume and pitch controls, and has an unlimited vocabulary potential.

Programs supplied with the Voicebox include: a machine language text-to-speech program that can be merged with BASIC programs; a text-to-speech program that incorporates the "Alien" face, whose mouth moves in sync with what is being said; a program demonstrating the Voicebox's ability to sing; and a spelling quiz program using the talking face as the quizmaster.

The Voicebox is available for the VIC and 64 for $95. For an additional $25, Commodore 64 users can add a comprehensive music and singing system. The capabilities of the 64's SID chip are incorporated into this program, which also allows the user to enter melodies through the keyboard.



The Voicebox Speech Synthesizer plugs directly into the VIC-20 or Commodore 64 user port.

The Alien Group
27 West 23rd St.
New York, NY 10010

Four Programs For Atari

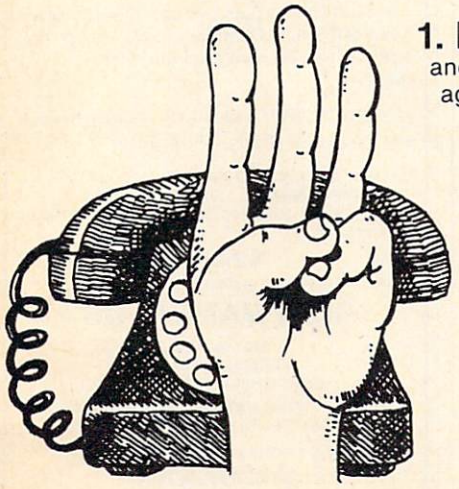
Advanced Computing Enterprises has added four programs to its Atari product list. They include an article indexer, a portfolio management system, a spelling game, and a math game.

MAX is the magazine article index program. It allows the user to code articles with keywords, and it performs sorts and searches in seconds. *MAX* is available on disk for $29.95.

Ace Money Machine makes use of a dollar cost averaging formula to help you manage your investment portfolio. The program maintains a complete history of the progress of your investments, and can provide a detailed graph upon request. The program sells for $19.95.

Word Wizard is a spelling tutorial game that allows the

The Modem that Delivers 3 Ways



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entry of word lists of up to 50 words. The program adjusts skill levels in relation to each student's progress. *Word Wizard* sells for $29.95.

Math Master is similar to *Word Wizard* in that it allows a parent or teacher to determine the problems to be solved and adjusts speed according to each student's success. The program is available for $29.95.

Advanced Computing Enterprises
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TI-99/4A Peripherals And Software

Texas Instruments has changed its marketing strategy for TI-99/4A Home Computer peripherals. Prices for peripheral equipment and some software have been cut, and TI has begun selling its disk-storage related peripherals as a package.

The Disk Drive Memory System, which now has a suggested retail price of $550, consists of the peripheral expansion box, the disk controller card, one disk drive, and a 32K memory expansion card. Under TI's old pricing system, the suggested retail price for the above combination of equipment was $1,200.

Other reductions include: the P-Code Card, cut from $250 to $100; the RS-232 card, reduced from $175 to $100; the telephone coupler, from $200 to $100; the Impact Printer, from $750 to $500; and TI Logo II, from $129.95 to $99.95.

In other news from TI, the company has signed manufacturing and marketing agreements for software from Brøderbund Software, Spinnaker Software, and Sega Enterprises. Under the agreements, the software makers will supply programs to TI, and TI will translate them to ROM cartridge and market them.

As a result of the agreements, TI's software library soon will include Brøderbund's *Choplifter*, a daredevil rescue game, and *David's Midnight Magic*, a high-resolution pinball game simulation.

Spinnaker's first offerings to TI are *Facemaker*, an educational game for 4- to 12-year-olds, and *Story Machine*, a program that teaches children to write sentences, paragraphs, and simple stories, and then brings the stories to life through color graphics and sound.

Sega, a recognized leader in coin-operated amusement games, will provide TI with *Congo Bongo*, a cartoon-like adventure that takes players over and through jungle obstacles; *Star Trek*, in which the player controls the starship Enterprise against the Klingons; and *Buck Rogers: Planet of Zoom*, a space adventure filled with challenging tunnels and channels to negotiate and bizarre aliens to outsmart.

Most of the above software is expected to sell for $39.95 in cartridge format.

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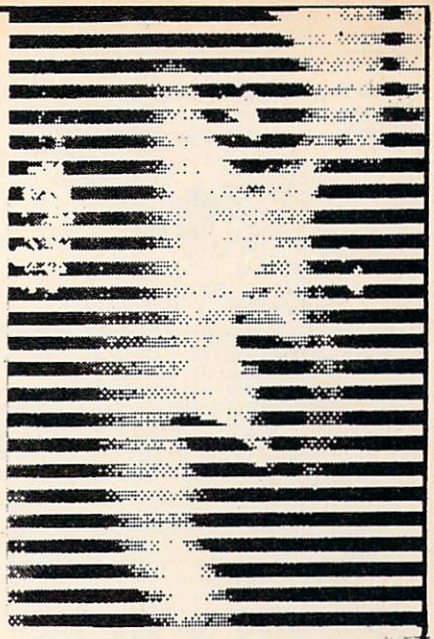

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After reading this issue of ***Compute,*** you are now fully aware of the many outstanding printers on the market today. But what you might not be aware of is that the printer you like best, might not be compatible with your computer and software. (The picture above is good example of printer incompatibility). At the **Printer Store,** we specialize in printers, so our experienced professional staff can help you choose the right printer for your personal and business needs. If you want the **Best Value, Low Price, Product Availability,** and **Support,** call The Printer Store and ask us about:

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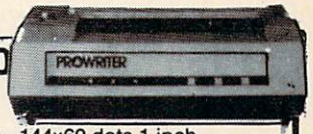

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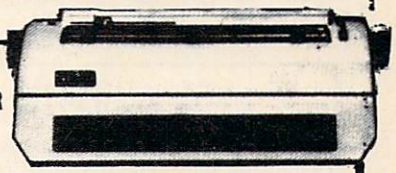

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The Dow-4 Gazelle is a realistic IFR simulation of a typical 4-place private plane. It is not a game. A manual with 30 pages of text plus 7 figures helps the novice learn to fly. Experienced pilots will enjoy flying the ILS approach. Response time under 1 sec average. Display shows full panel (10 dials & 11 lights) and indicates position of runway for landing. Realistic sound effects. See reviews in Jan 83 99'er and Jun 83 AOPA Pilot. Only requires joystick. $30.

EDITOR/ASSEMBLER

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Baseball For Atari, Commodore 64

Star League Baseball, an action and strategy game from Gamestar, is available for Atari and Commodore 64.

The game features realistic animation including windup, delivery, and the arc and shadow of a fly ball. Sounds generated by the program include the crack of the bat, the cheers of the crowd, and the music of the seventh inning stretch.

Players choose their starting team and pitcher, can bring in relievers, and can take batting practice against the legendary "Heat" Muldoon.

Star League Baseball, which can be played against the computer or a human opponent, sells for $31.95.

Gamestar, Inc.
1302 State St.
Santa Barbara, CA 93101
(805) 963-3487

Investment Manager, Disk Manager, And Games

Bytes and Bits has released a handful of programs for the Commodore 64 and VIC-20 computers.

Investment Portfolio Manager is a program to track volatile assets such as stocks and stock options.

The program, for disk-based Commodore 64 systems, can handle entries of up to $99,999 and can report on nine investment categories. It is available for $14.95.

Disk Directory Manager, which can sort more than 1500 filenames into an organized list, is available for $19.95 for the VIC or 64. The program is written in machine language.

In *Dungeons* for the VIC-20 with 16K expansion, the player creates characters who explore a 12-level, 1200-room dungeon. The game is available on tape or disk for $19.95.

Pak Alien for the unexpanded VIC is a machine language game that includes 100 difficulty levels. Guide your alien through a maze of interplanetary space particles while dodging seven aliens. *Pak Alien*, which can be played with joystick or keyboard, sells for $14.95 on tape or disk.

Bytes and Bits
524 East Canterbury Lane
Phoenix, AZ 85022
(602) 942-1475

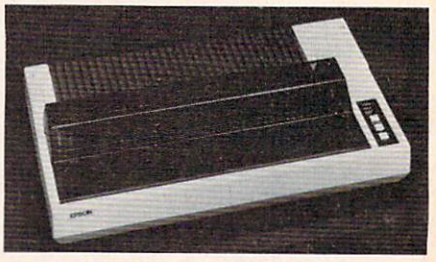
High Speed Printer

Epson America has introduced its new FX-100 dot matrix printer. The printer, which carries a suggested price of $895, provides a printing speed of 160 characters per second.

The printer offers a wide range of features including elite or pica spacing and a one-to-one graphics ratio so accurate graphics – including circles – can be drawn. Users also can create their own character formats on screen and download the font into the printer's memory.

The printer includes a rubber platen that can handle single sheet or roller-fed paper plus a removable tractor to handle pin-fed paper and forms.

Epson America, Inc.
3415 Kashiwa St.
Torrance, CA 90505
(213) 378-2220



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Arcade-Quality Apple

Third Millennium Engineering has introduced the Arcade Board, which generates arcade-quality color graphics and sound effects on Apple II, II+, and IIe computers.

The board uses many of the same video and sound chips used in coin-operated videogames.

The Arcade Board comes with more than 20 program demos, games, and utilities, and it adds more than 40 commands to Applesoft BASIC. These commands make it possible to create action with the convenience of BASIC, but with the speed of machine language. The Arcade Board sells for $225.

Third Millennium Engineering Corp.
1015 Gayley Ave., Suite 394
Los Angeles, CA 90024
(213) 473-2102

Speech In Many Voices

Don't Ask Software has produced a version of its *Software Automatic Mouth* (*S.A.M.*) for the Commodore 64 computer. In addition, the Apple and Atari versions of the program have been enhanced to include KNOBS, a feature that provides a range of different voices.

S.A.M., which occupies 2K of user memory, will convert phonetic spellings to speech. A text-to-speech Reciter program, available on the *S.A.M.* disk, will convert English spelling to speech; it takes 8K of user RAM. KNOBS gives the program access to a variety of voices, so characters can be made to converse.

The Commodore 64 version of the program and the updated Atari version sell for $59.95. The Apple II version, which contains a digital-to-analog converter and audio amplifier, sells for $124.95. Present owners of the program can receive the updated versions for a small fee, provided they have sent in their owner registration cards.

Other new products from Don't Ask include *Chatterbee*, a spelling game that includes a version of the *S.A.M.* voice synthesizer. *Chatterbee* is available for Atari and Commodore 64 for $49.95.

Wordrace for Commodore 64 is a vocabulary game with 2600 words. It is available in a gamepack that includes Claim to Fame, a history game, and Sports Derby, a sports fact game. The *Wordrace* gamepack is available on disk or cassette for $34.95.

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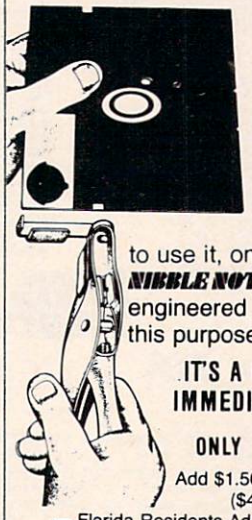

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Holiday Adventures

Chartscan Data is producing *bitCards*, text and graphic adventures designed as holiday gifts. *bitCards* are customized with personal references to the recipient, and the player's reward for completing the adventure is a personal message chosen by the sender.

The first *bitCard, A Christmas Adventure*, is available on disk for 48K computers in the Apple II series, and on tape for Atari 400/800, Radio Shack Color Computer, Commodore 64, unexpanded VIC, and VIC with 8K expansion. All versions sell for $16.95.

bitCards
120 South University Drive, Suite F
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Games Converted For Atari

Activision has converted two of its best-selling home videogames for Atari home computers.

The games, *River Raid* and *Kaboom!*, have been enhanced to make use of the increased power and memory availability of the Atari computers.

In *River Raid* the player pilots a B1 Strato-wing Assault Jet over a constantly changing river course. New twists added to the game include hovering hot-air reconnaissance balloons, helicopters and tanks that shoot back, vivid graphics and battle sounds, an expanded control panel, a pause feature, and the ability for more advanced players to select more difficult river sections.

Kaboom! features the Mad Bomber, a convict who roams the rooftops dropping bombs. The player maneuvers water buckets to catch the falling bombs. New additions to the game include a variation that allows one player to be the Mad Bomber and the other to catch the falling bombs, a high-score table, and a musical score which features the *1812 Overture*.

Both games retail for $34.95.

Activision, Inc.
2350 Bayshore Frontage Road
Mountain View, CA 94043
(415) 960-0410

Software Assortment For Timex/Sinclair

Dynacomp has introduced an assortment of software products for the 16K Timex/Sinclair computer.

The new programs are: *Blackjack*, $12.95; *Checkbook*, $14.95; *Data Filer*, $19.95; *Graphics Drawer*, $14.95; *Phone Book*, $12.95; *Pixel Drawer*, $14.95; *Tic-Tac-Toe*, $9.95; and *Word Scramble*, $9.95.

Each of the programs is described in the free product catalog available from Dynacomp.

Dynacomp, Inc.
1427 Monroe Ave.
Rochester, NY 14618

Game Cartridges For The TI

Funware, which recently was acquired by Creative Software, has added to its list of available cartridge software for the TI-99/4A.

Among the new games are: *St. Nick*, in which the player helps Santa fly through a maze and pick up toys while avoiding flying witches.

Schnoz-ola, a game based on a tale about a Mayan prince with tremendous jumping powers and a tremendous nose. The prince must climb a four-tiered pyramid to collect sacred flowers, while dodging fireballs tossed at him by angry gods.

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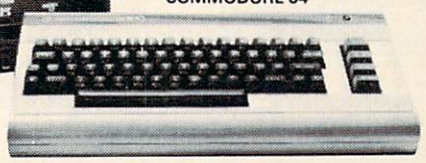

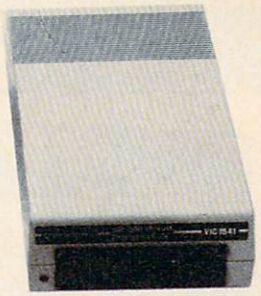

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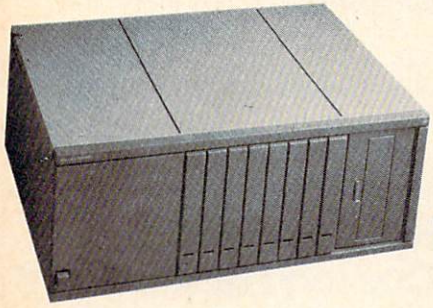

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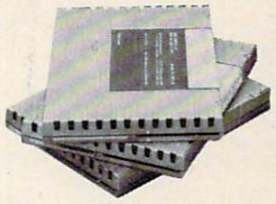

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Driving Demon, a game in which the player tries to drive as far and as fast as possible within a time limit. Problems include oil slicks, other cars, and engine troubles; navigational aids include a tachometer, speedometer, and a long-range scanner.

Funware's cartridge games sell for $44.95, and are guaranteed to work in all present and future versions of the TI-99/4A home computer.

Funware, Inc.
230 East Caribbean Drive
Sunnyvale, CA 94089
(408) 745-1655

Pinball Simulation For The 64

Brøderbund Software has converted *David's Midnight Magic*, a pinball simulation game, into Commodore 64 format.

The game, described as the next best thing to a real pinball machine, simulates dual flipper controls, bumper action, rollovers, sounds, and lights. The player can even put English on the ball, but too much will result in a tilt.

David's Midnight Magic, originally sold in Apple and Atari versions, is available for the Commodore 64 on disk for $34.95.

Brøderbund Software
500 Fifth Ave.
New York, NY 10110

Apple Graphics Program

T & G is an Apple graphics system from C & C Software. The program does not rely on shape tables, so execution is faster than for many other graphics programs.

T & G includes three character sets, the largest of which is 1½ times the size of standard Apple characters.

The characters can be placed on the screen using one of two commands. One is similar to BASIC's PRINT command; the other permits greater control over text placement. Lowercase is available in the two larger character sets, and the ability to print superscripts, subscripts, and text overlays is provided.

The program also is a powerful utility for producing static or animated graphics. The editor program supports full color and includes a command for clearing a precisely defined area of the screen.

T & G is available for $65.

C & C Software
5713 Kentford Circle
Wichita, KS 67220
(316) 683-6056

Hardware/Software Combo For Atari 800

MEM/EX is a memory expansion device for the Atari 800 computer. It replaces the operating system board and includes 4K of low-power CMOS static RAM mapped to the unused $C000 address space.

Included with the board is a powerful command-extender program called *COM/EX*. This adds ten edit-mode commands to the standard BASIC or Assembler cartridges, including the most used disk commands.

MEM/EX is compatible with all standard Atari 800 configurations; COM/EX requires at least one disk drive and DOS 2.0. The package is available for $129.95.

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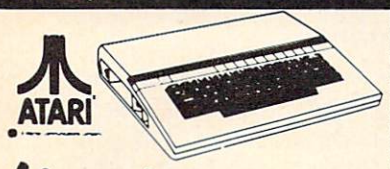

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Modifications Or Corrections To Previous Articles

Atari Caves Of Ice

Due to a problem with variable initialization, the Atari version of this game from the September issue (p. 60) provides more exits the longer the game is played. To insure there is always only one exit from the Caves, reader Jim Vail suggests that the A$(750) = "O" in line 100 be changed to:

```
A$="O":A$(750)="O":A$(2)=A$:
```

Also, Ohio reader Neil Morris notes that the program can be modified to run in less than 16K of memory by changing the GRAPHICS 8 in line 305 to GRAPHICS 6, then dividing all the numbers after the PLOT and DRAWTO commands in lines 32-85 by two (dropping any fractions).

VIC Diamond Drop

Some Commodore 64 color controls slipped into the VIC version of this game from the September issue (p. 84). For proper operation, change the [6] in line 50 to {GRN} (CTRL-6 for green) and the [7] in lines 100 and 102 to {BLU} (CTRL-7 for blue).

Mystery Spell For TI And VIC

The TI version of this educational game from September (p. 117) stores word lists properly to disk. However, tape users need to make the following changes:

```
1810 DISPLAY AT(23,1):"PLACE TAPE O
     R DISK IN DEVICE" :: ACCEPT AT
     (11,3):F$
1815 IF SEG$(F$,1,1)="C" THEN 1842
     ELSE OPEN #1:F$,INTERNAL,UPDAT
     E,FIXED 50
1842 IF J=0 THEN 1846
1844 OPEN #1:F$,OUTPUT,INTERNAL,FIX
     ED 50 :: FOR I=1 TO 20 :: PRIN
     T #1:B$(I):: NEXT I :: CLOSE #
     1 :: GOTO 230
1846 OPEN #1:F$,INPUT ,INTERNAL,FIX
     ED 50 :: FOR I=1 TO 20 :: INPU
     T #1:B$(I):: NEXT I :: CLOSE #
     1 :: CALL CLEAR :: GOTO 1760
```

Also, there is a minor typo in the VIC version (p. 127). In line 2170, LEFRT$ should be LEFT$.

VIC PILOT

There is a minor flaw in the turtle graphics feature of the PILOT interpreter in BASIC from the September issue (p. 166). If the turtle goes off the graphics screen during a loop, subsequent graphics commands are not interpreted properly. If you are using Program 1, make this change:

```
128 IFOS%=1THENPRINT"*PLOT WENT OFF SCREE
    N":D=0
```

If you are using Program 2, the Super Expander version, make this change:

```
143 GOSUB127:IFOS%=1THEND=0:GOTO11
```

Cracking The Kernal

The instructions for using Kernal ROM routines to LOAD data from tape or disk into the 64 (September 1983, p. 270) are incorrect. The proper series of machine language instructions to OPEN logical file 2 from device 8 (disk) with secondary address 0 and LOAD a file into memory starting at address 8192 ($2000) is:

```
      LDA   #$02
      LDX   #$08
      LDY   #$00
      JSR   SETLFS
      LDA   #$04
      LDX   #L,NAME
      LDY   #H,NAME
      JSR   SETNAM
      LDA   #$00
      LDX   #$00
      LDY   #$20
      JSR   LOAD
      RTS
NAME  .BY   'FILE'
```

Note that the accumulator must be set to 0 for a LOAD and 1 for a VERIFY, not vice versa as stated in the article. Our thanks to Lewis Kleinsmith for pointing this out.

Atari Dragon

Program 2 (August 1983, p. 88) fails to leave the current score on the screen at the end of the game. To eliminate this minor flaw, Stuart Goldenberg suggests the following correction and addition:

```
410 COLOR 32:PLOT 0,0:DRAWTO 19,0:PL
    OT 0,1:DRAWTO 10,1:POSITION 0,0:
    ? #6;"GAME OVER score ";W
435 POSITION 0,0:? #6;"{20 SPACES}"
```

TI Towers

The program for this article was renumbered before it was listed. As a result, the line numbers of the program do not agree with those mentioned in the article. However, the program will work as listed.

64 Ultrasort

When using Program 4 to test the 64 version of this machine language sorting routine (September 1983, p. 202), you should replace line 300 with:

```
300 SYS 49152,N,AA$(1)
```

The REM statement in line 291 is incorrect.

VIC Dots

In line 560 of this program from the September issue (p. 132), the spurious question mark should be removed. The first part of the line should read:

```
560 IFFNBX(ML+22)=...
```

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COMPUTE! Back Issues

Here are some of the applications, tutorials, and games from available back issues of **COMPUTE!**. Each issue contains much, much more than there's space here to list, but here are some highlights:

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Computers can be picky. Unlike the English language, which is full of ambiguities, BASIC usually has only one "right way" of stating something. Every letter, character, or number is significant. A common mistake is substituting a letter such as "O" for the numeral "0", a lowercase "l" for the numeral "1", or an uppercase "B" for the numeral "8". Also, you must enter all punctuation such as colons and commas just as they appear in the magazine. Spacing can be important. To be safe, type in the listings *exactly* as they appear.

Brackets And Special Characters

The exception to this typing rule is when you see the curved bracket, such as "{DOWN}". Anything within a set of brackets is a special character or characters that cannot easily be listed on a printer. When you come across such a special statement, refer to the appropriate key for your computer. For example, if you have an Atari, refer to the "Atari" section in "How to Type COMPUTE!'s Programs."

About DATA Statements

Some programs contain a section or sections of DATA statements. These lines provide information needed by the program. Some DATA statements contain actual programs (called machine language); others contain graphics codes. These lines are especially sensitive to errors.

If a single number in any one DATA statement is mistyped, your machine could "lock up," or "crash." The keyboard, break key, and RESET (or STOP) keys may all seem "dead," and the screen may go blank. Don't panic – no damage is done. To regain control, you have to turn off your computer, then turn it back on. This will erase whatever program was in memory, so always SAVE a copy of your program before you RUN it. If your computer crashes, you can LOAD the program and look for your mistake.

Sometimes a mistyped DATA statement will cause an error message when the program is RUN. The error message may refer to the program line that READs the data. *The error is still in the DATA statements, though.*

Get To Know Your Machine

You should familiarize yourself with your computer before attempting to type in a program. Learn the statements you use to store and retrieve programs from tape or disk. You'll want to save a copy of your program, so that you won't have to type it in every time you want to use it. Learn to use your machine's editing functions. How do you change a line if you made a mistake? You can always retype the line, but you at least need to know how to backspace. Do you know how to enter inverse video, lowercase, and control characters? It's all explained in your computer's manuals.

A Quick Review

1) Type in the program a line at a time, in order. Press RETURN or ENTER at the end of each line. Use backspace or the back arrow to correct mistakes.

2) Check the line you've typed against the line in the magazine. You can check the entire program again if you get an error when you RUN the program.

3) Make sure you've entered statements in brackets as the appropriate control key (see "How To Type COMPUTE!'s Programs" elsewhere in the magazine.)

We regret that we are no longer able to respond to individual inquiries about programs, products, or services appearing in **COMPUTE!** *due to increasing publication activity. On those infrequent occasions when a published program contains a typo, the correction will appear on the CAPUTE! page, usually within eight weeks. If you have specific questions about items or programs which you've seen in* **COMPUTE!**, *please send them to Readers Feedback, P.O. Box 5406, Greensboro, NC 27403.* ©

How To Type COMPUTE!'s Programs

Many of the programs which are listed in **COMPUTE!** contain special control characters (cursor control, color keys, inverse video, etc.). To make it easy to tell exactly what to type when entering one of these programs into your computer, we have established the following listing conventions. There is a separate key for each computer. Refer to the appropriate tables when you come across an unusual symbol in a program listing. If you are unsure how to actually enter a control character, consult your computer's manuals.

Atari 400/800

Characters in inverse video will appear like: INVERSE VIDEO
Enter these characters with the Atari logo key, {A}

When you see	Type	See
{CLEAR}	ESC SHIFT <	Clear Screen
{UP}	ESC CTRL -	Cursor Up
{DOWN}	ESC CTRL =	Cursor Down
{LEFT}	ESC CTRL +	Cursor Left
{RIGHT}	ESC CTRL *	Cursor Right
{BACK S}	ESC DELETE	Backspace
{DELETE}	ESC CTRL DELETE	Delete character
{INSERT}	ESC CTRL INSERT	Insert character
{DEL LINE}	ESC SHIFT DELETE	Delete line
{INS LINE}	ESC SHIFT INSERT	Insert line
{TAB}	ESC TAB	TAB key
{CLR TAB}	ESC CTRL TAB	Clear tab
{SET TAB}	ESC SHIFT TAB	Set tab stop
{BELL}	ESC CTRL 2	Ring buzzer
{ESC}	ESC ESC	ESCape key

Graphics characters, such as CTRL-T, the ball character ● will appear as the "normal" letter enclosed in braces, e.g. {T}.

A series of identical control characters, such as 10 spaces, three cursor-lefts, or 20 CTRL-R's, will appear as {10 SPACES}, {3 LEFT}, {20 R}, etc. If the character in braces is in inverse video, that character or characters should be entered with the Atari logo key. For example, {■} means to enter a reverse-field heart with CTRL-comma, {5■} means to enter five inverse-video CTRL-U's.

Commodore PET/CBM/VIC/64

Generally, any PET/CBM/VIC/64 program listings will contain words within braces which spell out any special characters: {DOWN} would mean to press the cursor down key. {5 SPACES} would mean to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing the other key), the key would be underlined in our listings. For example, S would mean to type the S key while holding the shift key. If you find an underlined key enclosed in braces (e.g., {10 N}), you should type the key as many times as indicated (in our example, you would enter ten shifted N's). Some graphics characters are inaccessible from the keyboard on CBM Business models (32N, 8032).

For the VIC and 64, if a key is enclosed in special brackets, |< >|, you should hold down the *Commodore key* while pressing the key inside the special brackets. (The Commodore key is the key in the lower left corner of the keyboard.) Again, if the key is preceded by a number, you should press the key as many times as indicated.

Rarely, you'll see in a Commodore 64 program a solitary letter of the alphabet enclosed in braces. These characters can be entered by holding down the CTRL key while typing the letter in the braces. For example, {A} would indicate that you should press CTRL-A.

About the *quote mode*: you know that you can move the cursor around the screen with the CRSR keys. Sometimes a programmer will want to move the cursor under program control. That's why you see all the {LEFT}'s, {HOME}'s, and {BLU}'s in our programs. The only way the computer can tell the difference between direct and programmed cursor control is the quote mode.

Once you press the quote (the double quote, SHIFT-2), you are in the quote mode. If you type something and then try to change it by moving the cursor left, you'll only get a bunch of reverse-video lines. These are the symbols for cursor left. The only editing key that isn't programmable is the DEL key; you can still use DEL to back up and edit the line. Once you type another quote, you are out of quote mode.

You also go into quote mode when you INSerT spaces into a line. In any case, the easiest way to get out of quote mode is to just press RETURN. You'll then be out of quote mode and you can cursor up to the mistyped line and fix it.

Use the following tables when entering special characters:

When You Read:	Press:	See:
{CLEAR}	SHIFT CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT CRSR ↑	
{DOWN}	CRSR ↑	
{LEFT}	SHIFT CRSR →	
{RIGHT}	CRSR →	
{RVS}	CTRL 9	
{OFF}	CTRL 0	
{BLK}	CTRL 1	
{WHT}	CTRL 2	
{RED}	CTRL 3	
{CYN}	CTRL 4	
{PUR}	CTRL 5	

When You Read:	Press:	See:
{GRN}	CTRL 6	
{BLU}	CTRL 7	
{YEL}	CTRL 8	
{F1}	f1	
{F2}	f2	
{F3}	f3	
{F4}	f4	
{F5}	f5	
{F6}	f6	
{F7}	f7	
{F8}	f8	
←	←	
↑	SHIFT ↑	

All Commodore Machines

Clear Screen	{CLR}	Cursor Left	{LEFT}
Home Cursor	{HOME}	Insert Character	{INST}
Cursor Up	{UP}	Delete Character	{DEL}
Cursor Down	{DOWN}	Reverse Field On	{RVS}
Cursor Right	{RIGHT}	Reverse Field Off	{OFF}

Apple II / Apple II Plus

All programs are in Applesoft BASIC, unless otherwise stated. Control characters are printed as the "normal" character enclosed in brackets, such as {D} for CTRL-D. Hold down CTRL while pressing the control key. You will not see the special character on the screen.

Texas Instruments 99/4

The only special characters used are in PRINT statements to indicate where two or more spaces should be left between words. For example, ENERGY {10 SPACES} MANAGEMENT means that ten spaces should be left between the words ENERGY and MANAGEMENT. Do not type in the braces or the words 10 SPACES. Enter all programs with the ALPHA LOCK on (in the down position). Release the ALPHA LOCK to enter lowercase text.

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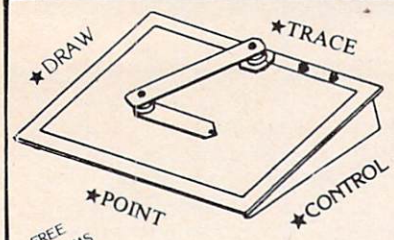

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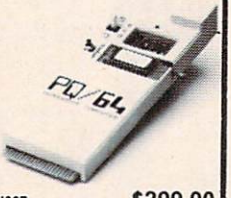

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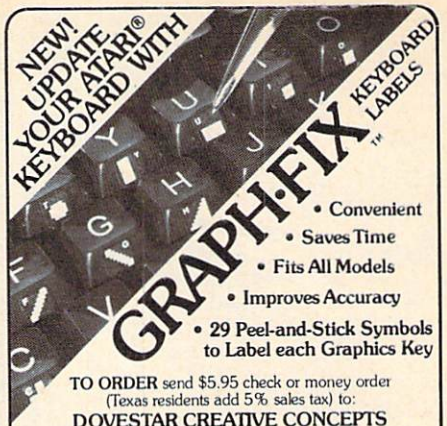

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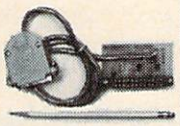

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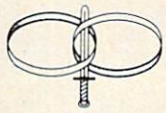

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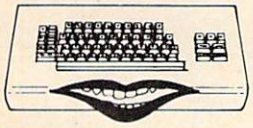

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