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Webster Dines Out— Action Game For Youngsters Programs For Apple, TI, Commodore 64, VIC-20, Atari, IBM PC, PCjr

How To Buy
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Which Features
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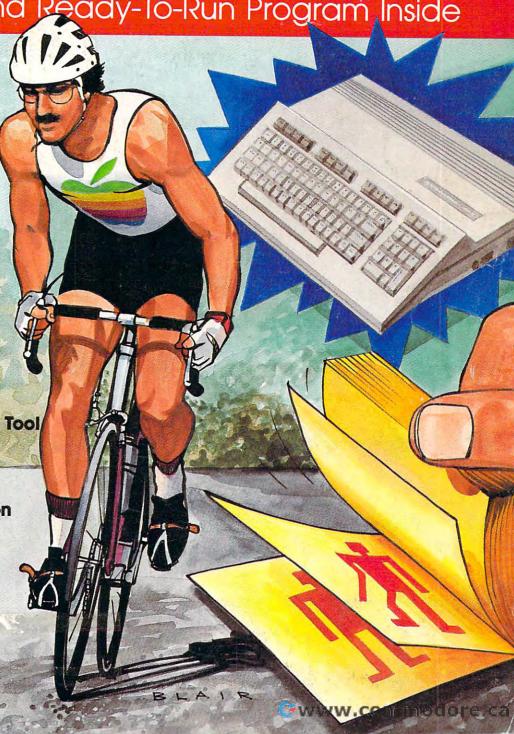
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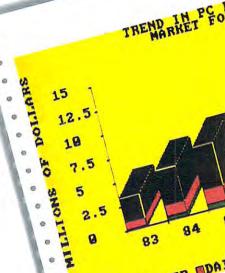
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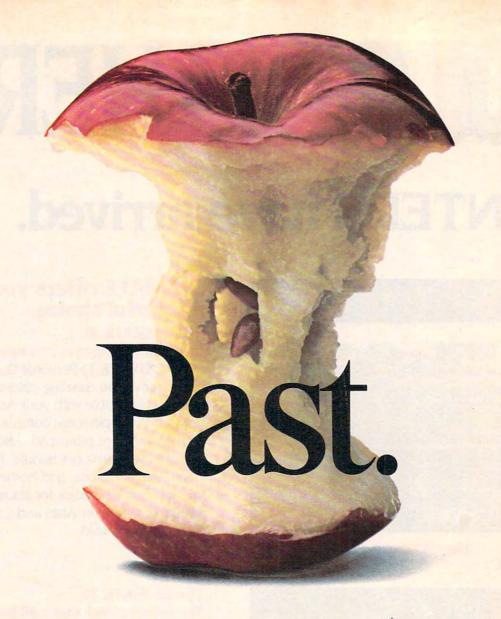
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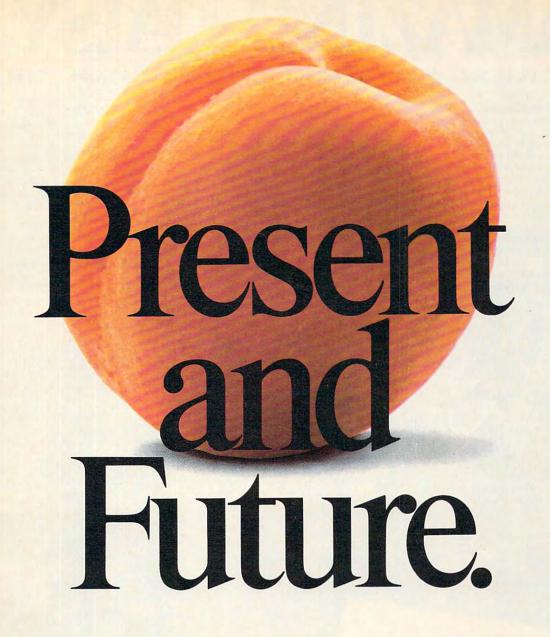
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THE RESULTS ARE IN

We found the printer which has all the features anyone could want. The winner is the Aprotek Daisy 1120, a real heavyduty workhorse printing at 20 characters per second. The manufacturer is Olympic Co. Ltd., a highly respected Japanese firm.

FEATURES GALORE

This printer has it all. To start with, it has a front panel Pitch Selector button with indicators which allows 10, 12, 15 characters per inch (CPI) or Proportional Spacing. There is a Select (Online) button (with indicator) and a Line Feed button. You can also set Topof-Form or Form Feed with the touch of the TOF button. Other front panel indicators include Power and Alarm.

To load a sheet of paper, simply place it in the feed slot and pull the paper bail lever. PRESTO! The paper feeds automatically to a 1 inch top margin and the carriage aligns to the selected left margin. In this manner, each page can have identical margins automatically. You can continue to compute while the Daisy 1120 is

APROTEK

printing. The built in 2K buffer frees up your computer while printing a page or two allowing you to go to your next job.

To really put your printer to work, the Cut Sheet Feeder option is great for automatic printing of those long jobs. Also available is the adjustable Tractor Feed option. Compare our option prices! Best of all the Daisy 1120 is quiet: only 57 dB-A (compare with an average of 62-65 dB-A for others).

COMPLETE COMPATIBILITY

The Daisy 1120 uses industry standard Diablo® compatible printwheels. Scores of typeface styles are available at most computer or stationary stores. You can pop in a 10, 12, 15 pitch or proportional printwheel and use paper as wide as 14". At 15 CPI you can print 165 columns-great for spreadsheets.

The Daisy 1120 uses the Diablo Hytype II® standard ribbon cartridges. Again universally available.

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EDITOR'S NOTES

With this issue, COMPUTE! has a new look. Several adjustments to the way we put together the magazine have been made in the past few months, and this issue implements a process which started—on the drawing boards—last year.

The personal computer marketplace is maturing and currently pausing for breath after several frenetic years in the early 1980s. Many manufacturers, and many computer magazines, have retired from the scene. There are approximately onefifth as many hardware and software companies today as there were a year ago.

For magazine publishers, this greatly diminished universe of advertisers represents a challenge. Fewer ads necessarily mean fewer pages.

While there are dozens of popular magazines like High Fidelity and Science Digest which have stabilized over the years at fewer pages than COMPUTE! currently prints, there are some economies which we must now effect. In a nutshell, we want to continue to bring our readers an equivalent amount of information in a smaller package every month.

Fortunately, there are several ways to seek painless concision. The first thing we looked at was the size of our typeface, the "point size."

COMPUTE! has always printed larger characters than is traditional for magazines of its class and audience. It may not be too easy to detect, but with this issue we have slightly reduced the type by one point in most of the magazine (one point equals 1/72 inch). "Reviews," "Readers" Feedback," and the "News & Products" sections have been reduced by two points. These are gentle reductions and bring COMPUTE!'s type in line with most other popular magazines.

However, even though there will be no decrease in readability, this change results in an average of 10 to 15 percent more information

per page.

To maintain the ease with which COMPUTE! can be read, we have made additional changes to our layout. For one thing, we have gone to a primarily three-column format, replacing our previous twocolumn design. Program listings, too, have changed from two- to . three-column format. Aside from contributing more words per page while still maintaining easy readability, these adjustments give our design staff greater flexibility to create layouts with more variety and eye appeal.

Finally, we have requested that our columnists write within one- or two-page limits each month. With the more economical type size and page layout, they will be able to deliver excellent information each month in less space. Ultimately, that frees the editors to increase the variety and content of COMPUTE!.

In a not entirely unrelated development, Philip Nelson has accepted the position of assistant editor of COMPUTE!. Philip has been on our staff as assistant technical editor for six months and has proven to be an excellent, careful editor and a fine writer as well.

We feel that these changes to COMPUTE! are both necessary and positive. These adjustments will allow us to continue to bring you the greatest number of high quality articles and programs in the years to

Richard Mansfield

Senior Editor

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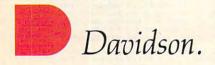
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READERS' FEEDBACK

The Editors and Readers of COMPUTE

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Closing The Quality Gap

I thought *letter quality* was a term used to describe typewriters or daisywheel printers. Now I have seen many dot-matrix printers claiming to be letter quality. How is this possible?

Alex Cutrone

Perhaps you're reading too much into the term letter quality. It simply means "good enough to use in a business letter." Printing of this quality has traditionally been equated with daisywheel printers, which create crisp, solid images by striking an inked ribbon with little character-shaped hammers, just like a typewriter.

Dot-matrix printers use a different technique, forming each character out of many tiny dots. The printhead contains several small pins which can be individually fired, pressing the ribbon against the paper to make a dot. As the printhead moves across the paper, the pins are rapidly fired in various combinations to form different characters.

Early dot-matrix printers left noticeable gaps between the character dots, giving the print a grainy appearance. As dot-matrix technology has improved, these gaps have been all but eliminated, producing print of much higher quality.

One way to improve print quality is to double-strike each character. Printing a character twice in the same spot puts more ink in each dot; since the dots are darker (and a little fatter), the print looks better. Enhanced printing also double-strikes each character, but offsets the printhead very slightly (less than a dot's width) before printing the character a second time. This fills in much of the space between dots.

Most dot-matrix printers have pins that are round in cross section. Since round dots don't fit neatly together, dot-matrix characters tend to have wavy edges, even in enhanced printing modes. To give the characters crisper edges and further alleviate the gap problem, some manufacturers have switched to pins with a squarer cross section. However, you can obtain high quality print from a machine that uses round pins: The Apple Imagewriter is one example.

By looking closely, you can still distinguish the best dot-matrix print from so-called letter-quality print. A letter produced with a Macintosh and an Apple Imagewriter doesn't look exactly the same as one typed on an IBM Selectric. But that's not to say it doesn't look good enough for "serious" use. Some people would say that the Macintosh-generated letter looks more impressive than one done on a Selectric.

The fact is that many people are already using dot-matrix printers for business correspondence. Judged by that practical standard, the better dot-matrix printers are indeed letter-quality machines. If you're thinking of purchasing a printer, see "How to Buy the Right Printer" elsewhere in this issue.

Runaway IBM Keys

My new PCjr is great except for one irritating feature. When I rest my finger on a key, the computer prints a long line of identical letters. When I press the backspace key to erase the extra letters, it repeats, too. How can I stop this repeating feature, or at least slow it down?

Peter Gliewell

You can find the answer to this and many other questions about IBM Personal Computers in the new book from COMPUTE! Publications, Mapping the IBM PC and PCjr by Russ Davies. Most microcomputers supply a repeating function for only a few editing keys such as the cursor controls or space bar. The PCjr has what IBM calls a typamatic keyboard: Nearly every key repeats when you hold it down. (The exceptions are keys such as Enter, which you would never want to repeat.)

Depending on your tastes, the typamatic function is either a godsend or a curse. The following program slows down or eliminates your PCjr's typamatic function:

- 100 PRINT "Enter a number to adjust typamatic"
- 110 PRINT " Ø Return to n
- ormal"
 120 PRINT " 1 Increase in
- itial delay" 130 PRINT " 2 - Half rate o
- f repeat"
- 140 PRINT " 3 Both 1 and 2 above"
- 150 PRINT " 4 Typamatic f unction off"
- 160 INPUT X:IF X<0 OR X>4 GOT O 160
- 170 X=X*2:DEF SEG=0
- 18Ø Y=(PEEK(&H488) AND (&HFF-&HE))
- 190 POKE &H488, (Y OR X)
- 200 PRINT "PCjr typamatic fun ction now adjusted"

The typamatic function uses two different time delays. There is a short initial delay between the time you first press a key and the time it begins to repeat. After repeating begins, there is another slight delay between each repetition. The program lets you adjust either or both of these delays. Note that the typamatic function affects the entire keyboard: If you turn it off, none of the keys—including the space bar and cursor controls—will repeat.

Commodore Disk Patterns

I have just finished reading your article about pattern matching on the Commodore disk drive. In the last paragraph of the section labeled "New Patterns," you talk about loading just the disk title, its ID, and the number of blocks free from the directory. Your suggestion is to use a filename not on the disk, such as 0:#\$&!%. I have found an easier way: Instead of the usual command LOAD "\$",8, use LOAD "\$\$",8. On a disk with a large number of programs, you cannot use this twice in a row or you'll get a FILE NOT FOUND ERROR. If you load the directory normally (LOAD"\$",8) after using LOAD"\$\$",8 you may use the latter command again.

George Sherman, Jr.

You've stumbled across a curious aspect of Commodore's disk directory system: a few words of explanation might be in order.



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First: "\$" is a legitimate filename. Try writing a short program and then saving it with SAVE "0:\$",8. No problem; the file will save without any errors. You'll find it in the directory, but note that LOAD "\$",8 brings in the directory, not the program. But you can still get the program with LOAD "0:\$",8.

Second: You may pattern-match without using the drive designator, although this will give you trouble. If you load a directory with LOAD "\$P*",8, you will get all files starting with the letter P. It's much better to command LOAD "\$0:P*", 8, which specifies the drive number. The reason for this is odd, and relates to the fact that the 1541 DOS (Disk Operating System) software was developed from that found in Commodore's older 4040 dualdrive unit. Single-slot Commodore drives don't know that they are single; they suspect that there's a second drive around somewhere (drive 1, which doesn't exist). So if you use type LOAD "\$P*",8, the disk drive will correctly get the directory from drive 0, and then try for a directory from nonexistent drive 1! It won't get it, of course, but it's left in "drive 1 mode," and the next job it gets without a drive specification will try drive 1 first.

Thus, if you enter LOAD "\$P*",8 again, the unit will go to drive 1, find no directory, and report FILE NOT FOUND. This won't happen if you command LOAD "\$0:P*",8 since drive 0 is forced.

Let's put these two together. When you type LOAD "\$\$",8 you are really telling the computer to look for a file with a name of "\$". Normally, it won't exist, so you'll get only the disk header and block count; but if you saved a file with that name as suggested above, you'll see it in the directory.

Illogical Apple Logic?

In the August 1984 issue of COMPUTE!, the ANDing and ORing of numbers was explained in the Readers' Feedback section. I tried doing some of the examples on my Apple IIe but I never got the result I expected. For instance, I POKEd the number 15 into location 7, then typed POKE 7,PEEK(7) OR 240. When I checked location 7 by typing PRINT PEEK(7), the result was 1. This also happened when I tried to AND a number. Why is this happening?

Michael Kurtz

On most computers, the BASIC statement PRINT 240 OR 15 gives the result 255. However, Apple (and Atari) computers have a different way of doing the logical operations AND and OR.

Instead of doing a separate AND or OR for each bit of the two numbers, Apples do only one logical operation, treating each of the numbers as a single logical value. A number whose value is zero is considered

logically false. Any other value is treated

The result of an OR operation is 0 only if both of the numbers are 0. An AND operation gives a result of 1, meaning true, if neither of the numbers is 0. Apple's representation for true is also unusual. Most computers use -1 to represent a true value, but Apple has chosen to use 1.

None of this is important in the situation where logical operators are used the most, conditional statements such as:

10 IF A<B AND A<C THEN PRINT "A IS BIGGEST"

Here, the Apple behaves the same as any other computer. The difference matters only if you want to operate on individual bits of a variable or memory location.

Atari Tape Tribulation

I recently got an Assembler Editor cartridge for my Atari 800. I tried out the example programs in the manual and followed Atari's instructions on entering source code and assembling to cassette using ASM,,#C:. After replacing the Assembler Editor cartridge with BASIC, I was not able to retrieve the machine language program with CLOAD as specified. I tried several things such as ENTER#C:, but nothing worked. When I did PRINT PEEK(1536), I always got 0. Any suggestions? My temporary alternative is to convert the hexadecimal object code from the ML program into decimal DATA statements using a BASIC program.

Doug Wilson

The manual is incorrect. You cannot use CLOAD, ENTER, or any simple Atari BASIC command to read machine language from tape. Your alternative is actually the best way to include short machine language routines in a BASIC program. However, there is a way to read machine language object files produced by the Assembler Editor. Unfortunately, when assembling to cassette the tape keeps going during the first pass of the assembly, creating an excessively long leader tone. This makes the tape quite difficult to read.

Instead of assembling directly to tape, assemble to memory and use the command SAVE #C:<start,end (where start and end correspond to the hexadecimal starting and ending addresses of your program). This will save the object code from memory to cassette. In BASIC, you can use this program to read and POKE the tape program into memory:

100 OPEN #1,4,0,"C:"
110 GET #1,A:GET #1,A
120 TRAP 140:GET #1,A:GET
#1,B:BEG=A+256*B:GET
#1,A:GET #1,B:FIN=A+
256*B

130 FOR I=BEG TO FIN:GET #1,A:POKE I,A:NEXT I: GOTO 120

140 CLOSE #1: TRAP 40000

This program will also load a disk object file if you change the device specification in line 100 and add the appropriate filename. Beware of loading ML programs that would overwrite the BASIC program.

1540 Disk Drives With A 64

I had a VIC-20 with a 1540 disk drive. Recently I decided to buy the Commodore 64. This leaves me with a big problem, which I hope you can help me with. Will the 1540 work with the 64? So far I haven't been able to get it to work.

Dave Lester

The best long-term solution is to see if your dealer can get you an upgrade ROM chip that will convert your 1540 to a 1541.

In the meantime, you should be able to save to disk without trouble. To load, you can use a trick to establish communications:

Instead of typing LOAD "filename",8 to bring a program into the 64, type POKE 53265,43: LOAD "filename",8. The screen will go blank, but the file should load correctly. When everything stops, type POKE 53265,27 (you'll have to do this without being able to see what you're typing) and the screen will return to normal.

The problem arises because the 64 is not able to transfer data to and from the drive as fast as the VIC-20 can. The 64 is slower because more time is required to maintain its 1000-character video display, as opposed to the VIC's 506-character display. When its screen is blank, the 64 operates at the same speed as the VIC-20, and loading can proceed without timing difficulties.

Garbage Collection And Backups

I have seen several references to "garbage collection" in connection with the operation of the Commodore 64, but I have not seen the same term used in connection with operation of the Apple, Atari, or IBM computers. Is the garbage collection routine peculiar to the Commodore, or does it exist on these machines as well?

I have also seen several programs advertised for the 64 which claim to allow you to copy an entire disk. This command exists in DOS on the IBM and Atari machines. Do these programs have some other purpose? Similarly, some of the software for the 64 says it will allow you to copy files from one disk to another. Does this command also not reside in DOS on the 64?

Pat O'Neil

The mysterious-looking term garbage collection has to do with strings. Strings are tricky for a computer to handle. The computer must set aside enough room in memory for all the strings declared in a program. The length of a string can change

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'No joke, I said.

'Not that budget,' the prominent politician continued. 'My budget. My checking's overdrawn.

They're threatening to disconnect my phones. I even

got into a shouting match with my wife when I tried to lay off the servants.

'Civil?'

'Not very. And I think I'm about to be audited. What would I show them? Who keeps receipts for embassy parties?'

At this point, we were disconnected. And although it was too late to teach proper money management to this prominent politician, there is a lesson all of us can learn from his misfortune.

Everyone has to pay their bills, and nobody likes to do it.

You can keep file folders full of bills, drawers stuffed with grocery receipts, envelopes brimming with cancelled checks, and at the end of the month, it still takes hours to figure out just where your money has gone. Not to mention how long it takes to straighten things out at the end of the year.

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nice people at Apple, who will explain, in their own
excruciating detail, just what I'm talking about."

The Apple II and the Home Budget.

With software programs like The Home Accountant™

and Dollars & Sense, the Apple II makes it easy to set up household books. First, it will ask you some questions about your home finances. Like how much money you bring in each month, how much rent you pay, and whether you owe money to credit card companies, mortgage

holders, or any other surly characters. Then, it will ask you to enter some of the bills you receive each month



An Apple II will take care of everything from your household budget to your taxes with software programs like Dollars & Sense, The Home Accountant, and Tax Preparer.

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phone, utilities, and the like. Then, it will ask you where you keep your money, and for the numbers of your various checking and savings accounts.

That's really all there is to it. After that, an Apple II can automatically write checks for all your fixed expenses each month. It will also tell you what other bills you can be expecting, and when you enter their costs, an Apple II will pay them, too.

An Apple II will see to it that your checkbooks remain balanced, and that you'll know when your expenses are about to exceed your income. It can even help you plan to buy a new car. Or a home.

Or a fur-lined boat, if your budget permits.



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How to avoid your hanker

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"Well, I think that about covers it. And what if. after all of this, you still have some money left over?

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as a program runs, causing memory allocation problems. Some BASICs, such as Atari BASIC, tackle this problem by making you DIMension every string before using it for the first time. This sets the maximum length of the string. Atari strings always end up at a single spot in memory after the program starts, and do not move.

Microsoft BASIC uses a different trick. When a string is created, the actual string is stored at the top of BASIC memory. The string's name, length, and a pointer to the address of the string are stored after your program in memory. If you change the string, the new string is copied to the current top of memory (below any other strings) and the pointer is changed. Sooner or later, the strings fill all memory from the top until they collide with variables, arrays, or the end of your program.

This is where garbage collection steps in. A garbage collection routine in BASIC looks at each string, finds the string data, and repacks each string back to the top of memory, discarding unused strings along the way. This can take a while. It's difficult to predict just when garbage collection will occur, and when it does, the machine appears to lock up (in some cases, for more than 20 minutes).

Garbage collection is also a problem on the Apple and IBM machines (and on most Microsoft BASICs), but you can restrict the size of string space on the IBM. This forces garbage collection to occur

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QUINSEPT, INC. P.O. Box 216, Lexington, MA 02173 (617) 641-2930 more frequently, and since the size of the string buffer is small, garbage collection never takes very long. If an IBM program uses a lot of strings, it is sometimes necessary to expand the size of the string area, with the resulting garbage collection problem.

Your question about Disk Operating Systems (DOS) points out some differences between the way a Commodore computer implements DOS and the method used by almost every other computer. Most computers use a RAM-resident DOS to control the disk drive, but Commodore's DOS is in ROM within the drive itself. While this saves user memory, it creates some problems. The 64 and the 1541 drive are like separate computers, and must communicate over a slow serial bus. Commands are sent to the drive to scratch, rename, format, etc. There is a built-in copy command, but it can only copy a file to the same disk. The drive has no way to directly communicate with another disk drive, so the computer must act as a go-between.

The programs you mention let you copy files or disks by reading the disk into computer memory, then copying from memory to another disk. Since Commodore DOS is in the disk drive, there are no built-in programs in the 64 to perform transfers between disks—hence the need for the programs you mention. Many disk duplicators also try to defeat copy-protection schemes, since it's otherwise impossible to back up commercial software.

IBM Hidden Files

I have an IBM PC/XT with one floppy disk and a 10-megabyte hard disk. When I ran CHKDSK on both drives, the computer said I had two hidden files taking up about 22K. What are hidden files, and are they accessible?

Dennis Heckman

When you power up an IBM personal computer, it performs a complex series of housekeeping operations before turning the system over to you. This process usually involves loading two hidden, read-only system files named IBMBIO-.COM and IBMDOS.COM from disk. These are machine language programs which the system needs to operate correctly.

IBMBIO.COM is an extension of the PC's operating system—called BIOS for Basic Input/Output System—most of which is permanently stored in ROM (Read-Only Memory). The IBMBIO.COM program loads and executes when the system boots up, to initialize input/output devices and perform other system tasks. This is done to correct errors (and there are some) permanently "wired into" the ROM BIOS, and to allow for new devices such as the PCjr's cartridges. IBMBIO.COM is about 3.5K in length.

The PC's DOS (Disk Operating System) is a separate program, roughly 19K

long, for manipulating disk data. Since none of DOS is stored in ROM, it's also necessary to load the IBMDOS.COM program from disk and install it in memory when the system boots up. After initializing the system for BIOS, IBMBIO.COM moves IBMDOS.COM into the correct memory area and transfers control to DOS, which in turn does its own initialization before turning the system over to the user.

Files ending in .COM are system files (distinguished from user files which you can alter at will). Since IBMBIO.COM and IBMDOS.COM are critical to normal operation, they're made invisible to user commands such as DIR (disk DIRectory). Out of sight, out of mind—if you don't know a file exists, you'll be less likely to erase it. Both files are further protected by making them read-only: If you can't write to a file, you're less likely to corrupt it by accident.

It is possible to access system files. After each filename in the disk directory is a file attribute byte which defines the file type. Using the DEBUG program described in your DOS manual, you can read the disk directory, change a file's attribute byte to remove its protective attributes, and write the modified sector back to the disk. However, few users would have any reason to rewrite a system file, and the risk of inadvertent error is enormous. At best, the error might crash the system; at worst, you might lose an entire disk of data. If you want to try modifying a system file, practice on a disk that doesn't contain any important data. You can find a detailed discussion of system files and the boot process in Chapter 1 of COMPUTE!'s Mapping the IBM PC and PCjr by Russ Davies.

Commodore Monitors

What is the difference between a Commodore 1701 and 1702 monitor?

Andy Nagai

There is no appreciable difference between these monitors. The 1701 model changed to 1702 when Commodore began using a different picture tube supplier in late 1983. Cosmetically, it's nearly impossible to tell the two apart. They're virtually identical in appearance, and the electrical connections appear to be the same in both models. We have a number of both models here at COMPUTE!, and we've noticed that the resolution appears slightly sharper on the 1702s, but this is only because they're newer than the 1701s. (The color on a monitor gradually fades after prolonged use.)

Commodore also makes the 141 Color Monitor, essentially a 1702 with a charcoal gray color designed to match the Plus/4 and Commodore 16. It's compatible with the VIC-20 and 64. Commodore's newest monitor entries are the 1901 Monochrome Monitor and the 1902 RGBI/Composite Monitor. Each was announced at the Winter CES in support of the Commodore 128.



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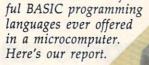


The Commodore 128: A Hands-On Report

Tom R. Halfhill, Editor

Commodore's new three-in-one machine, the Commodore 128 Personal Computer, should be hitting store shelves in June. In mid-March, COMPUTE! visited Commodore's U.S. headquarters in West Chester, Pennsylvania to more closely examine the 128, which was announced at the Winter Consumer Electronics

Show in January (see "The Next Generation: New Computers at the Winter CES," April 1985).
Although a few specifications were not finalized, we found the 128 to be a versatile machine with one of the most powerful BASIC programming



ne of the most imitated trends in personal computing lately has been "integrated software"-products that are actually three or more programs in one, like Lotus 1-2-3.

Now Commodore is introducing a fresh twist-integrated hardware. With the Commodore 128 Personal Computer, essentially Commodore is wrapping up three computers in one box to sell for under \$300 retail. The deceptively small package

1. A standard Commodore 64 with 64K of Random Access Memory (RAM) capable of running virtually all existing 64 software-estimated at 6,000 to 10,000 programs, mostly home and educational.

2. An enhanced Commodore 64 with 128K of RAM and an extremely powerful new BASIC that almost makes PEEK and POKE obsolete.

3. A Z80-based 128K computer designed to run existing software written for the CP/M (Control Program for Microcomputers) operating system—at least 10,000 programs, mostly business/professional.

Expandable to 512K with a RAM disk option, the Commodore 128 also works with all Commodore 64 peripherals as well as a new line of accessories, such as the much faster 1571 disk drive. Rounding out the package are such features as 80-column video in the 128K and CP/M modes, RGB (red-green-blue) high-resolution video output, and all the same ports and interfaces found on the Commodore 64.



efore the Commodore 128 was announced at the Winter CES, rumors indicated it would simply be an expanded Commodore 64. Even after it was unveiled, some people described it as a CP/M computer with a Commodore 64 emulation mode.

But the Commodore 128 truly is the near-equivalent of three computers in a single box. Outside, all three computers share the same sleek plastic case and 92-key keyboard. Inside, they share the same RAM chips and power supply, but that's about all. The 128 actually contains three separate central processing units (CPUs), two separate BASICs, two independent video display chips, separate banks of Read Only Memory (ROM), and even different memory maps, depending on which mode is selected. What's more, the machine can be operated in five distinct modes: Commodore 64 mode, 128 mode with 40-column video and graphics, 128 mode with text-only 80-column video, CP/M mode with 80-column video, and CP/M mode with 40-column video.

CPU chips include the 6510 for 64 mode and the 8502 for 128 mode-both 6502-compatibleand the Z80A for CP/M mode. Video chips include the VIC-II for 64 mode and 40-column 128 mode, plus an 80-column chip for 80-column 128 mode and CP/M mode. A synthesizer chip—the Sound Interface Device (SID)—is shared by all three microprocessors. Programming languages include BASIC 2.0 in 64 mode and BASIC 7.0 in 128 mode, and a machine language monitor is available in 128 mode and CP/M mode.

Does all this sound confusing? Don't feel bad—it is. Even when using the Commodore 128, you can sometimes forget which mode the computer is in. This is especially true of the 64 mode and 40-column 128 mode, which appear virtually identical on screen.

Furthermore, some modes let you switch to other modes, but not back again without restarting the machine. And speaking of cold-starts, the Commodore 128 can be switched on in *any* of its five modes, depending on its state at power-up. When you hit the power switch, the computer first checks to see if a CP/M system disk is inserted in the

drive. If so, it defaults to 40- or 80column CP/M mode (usually 80 columns). Otherwise, it checks the cartridge slot for a Commodore 64 cartridge program. If it finds one, it automatically switches to 64 mode and runs the cartridge. If there's no 64 cartridge, the computer checks for a 128 cartridge. If it finds one, it comes up in 128 mode (either 40 or 80 columns) and runs the 128 cartridge. If no 128 cartridge is plugged in, the computer checks to see if its 40/80 DISPLAY key is pressed. If so, it starts up in 80-column 128 mode. Otherwise, it switches to 40column 128 mode.

With so many options, operating the Commodore 128 will take some getting used to.

ne of the biggest questions about the Commodore 128 is its degree of Commodore 64 compatibility. Stung by criticism and slow sales because of the Plus/4's lack of 64 compatibility, Commodore went to great lengths to make sure the 128 would run all existing 64 software. In fact, Commodore claims the 128 is 100 percent 64 compatible.

Our tests showed the 128 had no trouble with a wide range of Commodore 64 programs written in BASIC and machine language. We ran a number of programs published in recent issues of COMPUTE! and COMPUTE!'s GAZETTE, including SpeedScript 3.0. Only one program failed: "TurboDisk" (COMPUTE!, April 1985). TurboDisk, a machine language utility which speeds up disk loading by as much as 300 percent, ran fine on a 128 hooked up to a 1541 disk drive, but would not work on a 128 connected to the new 1571 disk drive. We weren't particularly surprised, because TurboDisk works by reprogramming the load routines both inside the computer and in the drive. Any drive that isn't completely 1541-compatible cannot handle TurboDisk.

Since the 1571 is designed to be much faster than the 1541, it may seem that utilities such as Turbo-Disk are superfluous anyway. However, keep in mind that the 1571, like the Commodore 128, is a multimode device. When the 128 is operating in 64 mode, the 1571 drive behaves just like a 1541—it stores

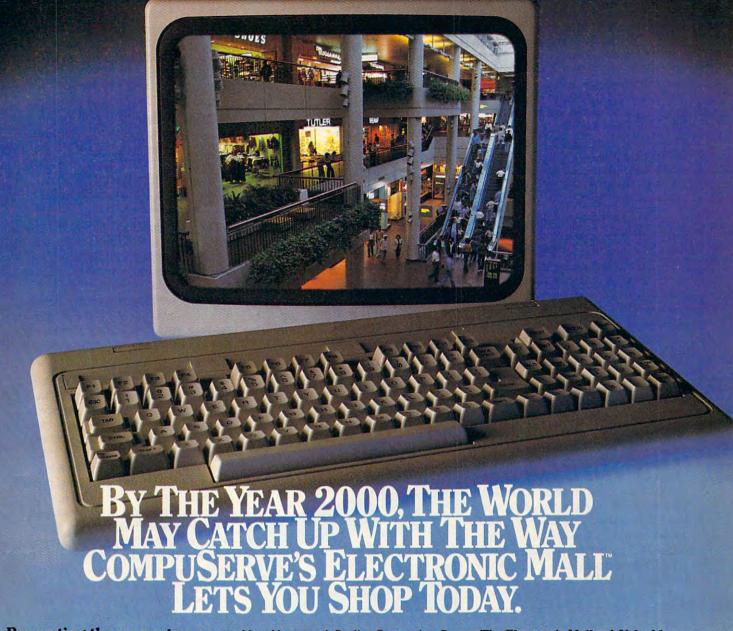
170K of data per disk and runs fairly slow. When the computer is switched to 128 mode, the 1571 speeds up about 500 percent and becomes a double-sided drive, storing about 360K per disk. And when the computer is in CP/M mode, the 1571 runs about 12 times faster than a 1541 and stores 410K on a floppy.

In CP/M mode, the 1571 also is supposed to read disks in IBM System 34 format, such as those made for Osborne and Kaypro CP/M computers. However, the 1571 drive we tested would not load our Osborne disk. A Commodore representative told us the 1571 we were using was still a prototype, and that final production models definitely would read CP/M disks. He also said that production 1571s would be fully 1541 compatible, so that programs like TurboDisk should work too.

If the final 1571s are not completely 1541 compatible, Commodore will run into trouble on another front—commercial copy protection. Some copy-protection schemes depend on precise timing and certain routines within the 1541 disk drive ROMs. If much is changed, the disks won't load. Before acquiring a Commodore 128 and 1571 drive to run 64 software, it would be a good idea to try loading some commercial disks first to make sure they work.

he best news about the Commodore 128 is BASIC 7.0, the powerful BASIC interpreter available in 128K mode. It is, perhaps, the most powerful BASIC ever offered in a personal computermore complete than even IBM BASIC and MSX BASIC. It contains all the commands in Commodore 64 BASIC 2.0, all the disk and file commands of BASIC 4.0 (as found on the Commodore 8032 and Super-PET), and nearly all the graphics and sound commands of the Super Expander 64 cartridge, Simon's BASIC, and the Plus/4's BASIC 3.5.

BASIC 7.0 makes it possible to draw graphics, define and move sprites, create sound effects, and play music without PEEKs, POKEs, or machine language. Sprite movement is implemented during a machine-level interrupt, so a few BASIC statements can keep up to eight sprites moving simultaneously



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An H & R Block Company www.commodore.ca while the program performs other tasks—or even stops. To make it easier to define sprites, you can grab any predrawn shape off the screen and store it as sprite data, or design the sprite bit by bit with a built-in sprite editor. Playing music with the SID chip has always been tedious because of the large number of POKEs required, so BASIC 7.0 has ten predefined musical instrument sounds available with a single command.

Because BASIC 7.0 is so extensive, we can't explain every command in detail, but we can cover some highlights. Remember that some specifications or syntax rules may have changed by the time the Commodore 128 entered final production.

The disk and file commands include DLOAD and DSAVE (for loading and saving to disk without adding ,8 to the filename); DVERIFY (compare a disk file with a file in memory); CATALOG and DIREC-TORY (for displaying disk directories without erasing a BASIC program in memory); COPY (duplicate a file using dual drives); BACK-UP (copy an entire disk with dual drives); APPEND (open a sequential file for updating); COLLECT (reorganize the Block Allocation Map); CONCAT (combine two disk files); HEADER (format a disk); RENAME (assign a new filename to an existing file); SCRATCH (delete a file); DO-PEN and DCLOSE (open or close a disk file); DCLEAR (close all disk channels); RECORD (for positioning the relative file pointer); DS and DS\$ (read the error channel); BLOAD (load a binary machine language file); BSAVE (save a block of memory as a binary file); and BOOT (load and run a machine language file).

Note that none of these commands adds new capabilities not available with a Commodore 64 and 1541 drive; they merely simplify the syntax. For example, COLLECT is equivalent to OPEN 15,8,15, "V0":CLOSE 15. The commands can also be abbreviated, as in D-SHIFT-L for DLOAD or even SHIFT-RUN/STOP to automatically load and run. In addition, the special function keys are preprogrammed to execute certain frequently used commands, such as DIRECTORY.

prite commands not only replace the old-fashioned POKEs, but also offer more options. And the demo programs we saw proved that BASIC 7.0 can move sprites fast enough for goodquality games without machine language.

SPRDEF

Entered in direct mode, this command activates the built-in sprite editor. An editing window appears on screen, and you're prompted to select sprite 1 through 8. A number of subcommands let you clear all the sprite data, move a crosshair, turn pixels on and off, and change colors for multicolor sprites. When you're done designing the sprite, you reenter BASIC by pressing SHIFT-RETURN, then RETURN again. BASIC 7.0 does not require you to



set aside memory for sprite data; instead, it reserves a 512-byte block (for eight 64-byte sprites) beginning at location 3584 (\$E00 hex).

SPRITE #,on/off,foreground, priority,X,Y,mode

Sets up various sprite attributes, including sprite color, foreground/background priorities, initial X and Y position, and single color/multicolor.

SPRCOLOR

Defines the multicolor registers shared by all sprites.

SPRSAV sprite#,string SPRSAV string,sprite#

Moves sprite definition data into a string or vice versa. For example, you can define a sprite by first drawing a shape on the screen with various graphics commands, then copy the shape into a string with the SSHAPE command, and finally move the string into the sprite data block with SPRSAV. You could also copy the sprite pattern directly to the screen with SPRSAV and GSHAPE.

MOVSPR sprite#,X,Y

Moves a sprite to the horizontal and vertical screen coordinates specified by X,Y. This is called *absolute movement* and is like the POKEs used to move sprites to screen positions on the Commodore 64.

MOVSPR sprite#,+/-X,+/-Y Moves a sprite plus or minus the number of screen coordinates specified by X,Y. This is called relative movement and is useful when you don't know the sprite's current position. For example, you could move sprite 5 seven positions to the left and ten positions down with MOVSPR 5,-7,+10.

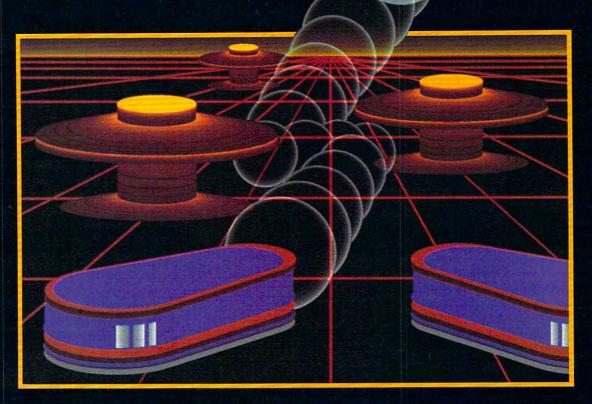
MOVSPR sprite#, angle #speed

Moves a sprite continuously in a certain direction at a specified speed via a machine level interrupt, even when the BASIC program is executing other lines or is stopped. When the sprite disappears off the screen, it wraps around and reappears at the opposite end of the screen. This command is useful when you want to send a sprite flying on a predetermined course and speed while your program does other things. For instance, with this command you could quite easily animate the rocks in an Asteroids-type game while your program takes care of checking the joystick and moving the player's ship. The angle parameter specifies the direction in degrees (0 = up), and #speed the velocity. To move sprite 1 continuously along a horizontal path from left to right, you would type MOVSPR 1,90 #5. To move it vertically from top to bottom a little faster, you would type MOVSPR 1,180 #5. Of course, the sprite must be positioned somewhere on the visible screen to begin with.

COLLISION type, line#

Detects sprite collisions and diverts the program to a subroutine starting at the line specified by *line#*. The *type* parameter lets you detect different kinds of collisions. Examples: COLLISION 0,1000 passes control to a subroutine at line 1000 when two sprites collide. (The subroutine must end with a RETURN.)

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COLLISION 1,2000 passes control to a subroutine at line 2000 when a sprite collides with a screen object. COLLISION 2,10000 diverts the program to a subroutine at line 10000 when a sprite is touched with a light pen.

BUMP(type)

Detects sprite collisions and returns a value corresponding to the sprites involved. This makes it possible to determine which sprites collided or if a collision happened off the visible screen (invisible to COLLISION). BUMP(0) records sprite-to-sprite collisions, and BUMP(1) records sprite-to-screen collisions.

raphics commands make up for the deficiencies in BASIC 2.0 and complement the sprite commands. They're also fairly fast for a BASIC interpreter. Here's just a sampling:

GRAPHIC mode #, clear, window

Flips the screen to the graphics mode specified by mode#. Mode 0 is 40-column text (default); 1 is hi-res graphics; 2 is hi-res graphics with a text window; 3 is multicolor graphics; 4 is multicolor graphics with a text window; and 5 is 80-column text (RGB only). The text windows are similar to those on Atari and Apple computers—they allow a few lines of text beneath the graphics window on the upper part of the screen. The text windows start at line 19, but that can be changed with the window parameter in the GRAPHIC statement. The clear parameter lets you specify whether the screen will be cleared upon entering the new mode (0 = no clear, 1 =clear).

COLOR source #, color

Sets up the color registers. The color# parameter defines the color from 1 to 16. The source# parameter specifies the color register affected—0 for the 40-column background, 1 for the graphics mode foreground, 2 for the multicolor graphics mode primary color, 3 for the multicolor graphics mode secondary color, 4 for the 40-column border, 5 for the character color, and 6 for the 80-column background color.

BOX source #,X1,Y1,X2,Y2,angle, paint

Draws a box on the hi-res screen.

to 3), X1, Y1, X2, Y2 are the X and Y coordinates of the opposite corners, angle is the rotation in degrees (default = 0), and paint specifies whether the box will be filled (0 = hollow, 1 = solid). Example: BOX 1,10,10,60,60,0,1 draws a filled green box in the upper-left corner of the screen.

Source# defines the color register (0

CIRCLE source #, X center, Y center, X radius, Y radius, arc angle 1, arc angle 2, angle, increment

Draws circles, ellipses, arcs, triangles, octagons, and other polygons on the hi-res screens. Source# is the color register (0 to 3), X center and Y center are the X and Y coordinates of the centerpoint, X radius and Y radius are the X and Y coordinates of the radius, arc angle1 is the starting arc angle in degrees (default = 0), arc angle2 is the ending arc angle in degrees (default = 360), angle is the rotation in degrees (default = 0), and increment specifies the number of degrees between segments (default = 2). Examples: CIRCLE 1,160,100,65,50 draws a green circle; CIRCLE 1,160,100,65,10 draws green ellipse; CIRCLE ,60,40, 20,18,,,,45 draws an octagon, and CIRCLE ,260,40,20,,,,,90 draws a diamond.

DRAW source#,X1,Y1 TO X2,Y2 ...etc.

Draws a dot, line, or figure on the hi-res screens. *Source#* is the color register (0 to 3), *X1* and *Y1* are the starting screen coordinates, *X2* and *Y2* are the following screen coordinates, and more coordinates can follow, up to BASIC's line length limit. Examples: DRAW 1,100,50 plots a dot at coordinates 100,50 because no endpoint is specified; DRAW 1,100,50 TO 100,75 draws a vertical line from 100,50 to 100,75; and DRAW 1,10,10 TO 10,60 TO 100,60 TO 10,10 makes a triangle.

LOCATE X,Y

Positions the invisible graphics cursor at hi-res screen coordinates *X*, *Y*. This defines the default starting point for all the drawing commands.

PAINT source #, Xstart, Ystart, mode

Fills an area on the hi-res screen. Source# is the color register, Xstart and Ystart define the starting coordinates, and mode specifies which area to fill (0 = fill the area defined by source#, 1 = fill the area defined by

any nonbackground color). Example: CIRCLE ,160,100,65,50: PAINT ,160,100 draws and fills a circle using the default foreground color.

SSHAPE string, corner1, corner2

Stores shapes drawn on the hi-res screens into string variables. The rectangular area of screen data between coordinates *corner1* and *corner2* is saved in the string variable *string*. The area which can be stored is limited by the 255-character capacity of a BASIC string. SSHAPE is very similar to GET in IBM BASIC.

GSHAPE string, corner1, corner2, mode

Plots the data stored in a string variable as a shape on the hi-res screens. It is the opposite of SSHAPE. Corner1 and corner2 define the rectangular screen coordinates, and mode specifies how the shape will be plotted. If mode = 0, the shape is placed as it exists; 1 inverts the shape; 2 performs a bitwise OR when the shape is overlapped onto the screen; 3 ANDs the shape with the screen; 4 XORs (exclusive-ORs) the shape with the screen. GSHAPE corresponds to PUT in IBM BASIC.

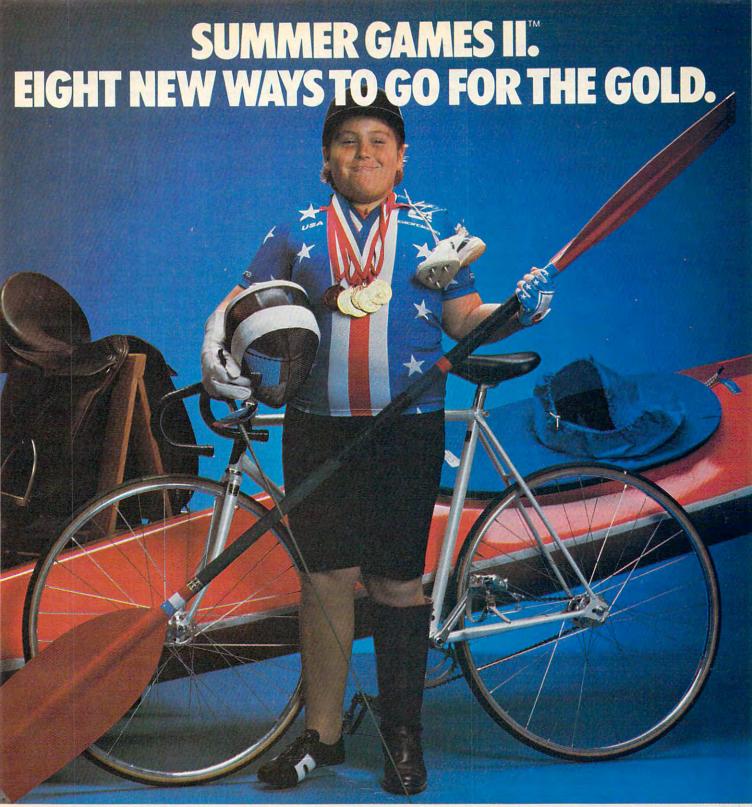
ound commands in BASIC 7.0 take much of the tedium out of creating sound effects and music with the versatile but complex SID chip. Together, BASIC 7.0 and the SID chip give the Commodore 128 the best sound capability of any personal computer now on the market. Here are a few examples:

SOUND voice, freq, dur, sweep, min, step, wave, width

Plays a sound with the selected voice, frequency, and duration. Voice can be 1 to 3, freq 0 to 65535, and dur 0 to 32767 jiffies (a jiffy equals 1/60 second). The following parameters are optional. Sweep defines the direction for a sweep (shifting frequencies), with 0 = up, 2 = down, and 3 = oscillation. Min sets the minimum frequency for a sweep; step picks the step value for a sweep; wave chooses a SID waveform (0 = triangle, 1 = saw, 2 = square, 3 = noise); and width specifies the width for a pulse waveform.

PLAY "O oct,T tune,U vol,V voice,X filter,notes"

Plays one or more notes using a selected octave, envelope, volume,





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voice, and filter. Oct specifies the octave 1 to 6; tune an envelope 0 to 9 (see below); vol the volume 0 to 9; voice 0 to 2; filter (0 = off, 1 = on); and note can be A, B, C, D, E, F, or G with sharps, flats, dots, and standard durations (quarter notes, half

notes, etc.). An M in this parameter tells the computer to wait for all voices currently playing to end. Any number of notes can be strung together in this field, up to BASIC's line length limit. The predefined envelopes selectable with the tune

parameter are 0 = piano, 1 = accordian, 2 = calliope, 3 = drum, 4 = flute, 5 = guitar, 6 = harpsicord, 7 = organ, 8 = trumpet, and 9 = xylophone.

ENVELOPE #,attack,decay,sus, rel,wave,width

Commodore 128 Memory Management And Machine Language

Charles Brannon, Program Editor

Using an external memory cartridge, the Commodore 128 can be expanded up to 512K RAM. This memory is not directly available for programs, though, but is used as a *RAM disk*—the functions of a disk drive are simulated with the memory chips. This provides faster throughput than a hard disk, but all information is lost when the power is turned off. You need to dump the contents of a RAM disk to a regular disk at the end of each session.

A special memory management unit (MMU), located at \$FF00, controls the 128's complicated memory map. The MMU interprets memory addresses even before the microprocessor sees them. It permits you to swap between banks of 64K, but can leave a small portion of memory as common memory. You don't always want zero page and the stack to disappear when you change banks. The MMU lets you bank between four 64K banks, and allows multiple banks of 256K, up to one megabyte of memory.

The MMU controls whether the VIC chip or 80-column chip controls the screen display, and even senses the position of the 40/80 DISPLAY switch (though the software must interpret this switch). The MMU controls access to RAM or ROM, allowing either to be visible in the memory map. A programmer can set up a series of preset memory configurations and quickly select them by writing to the MMU. The address of the VIC chip can be relocated anywhere within the virtual 256K memory space.

The MMU also controls the fast serial port used with the 1571 disk drive (and conceivably with other fast peripherals). It determines the clock speed of the 8502, and controls which of the three microprocessors (6510, 8502, Z80A) is in control.

Although not supported in ROM, it's possible to have all three microprocessors running by quickly switching between them. Maybe someone will find a way to take advantage of this potential multiprocessing capability.

Machine language programmers will appreciate the Commodore 128's machine language monitor, entered from BASIC with the MONITOR command. It pretends that the 128K of memory is contiguous and permits five-digit hexadecimal addresses. It makes full use of 80 columns if selected. The monitor works much like 64 Supermon, with commands to assemble, disassemble, fill, go to address, hunt through memory for a hexadecimal string, load, display memory with ASCII equivalents, display registers, save, transfer a block of memory, verify a saved program, exit to BASIC, modify memory, modify registers, and display disk error status.

BASIC commands for machine language include BLOAD and BSAVE to load and save machine language programs or other binary files, and BOOT to load and run a machine language program. The familiar USR, WAIT, POKE, PEEK, and SYS commands can now reference the second 64K of memory with the BANK command. SYS can be followed by four parameters that are transferred into the accumulator, X register, Y register, and status flag register. After a SYS, the RREG command can transfer the contents of these registers into four variables. This makes it much easier to pass information between BASIC and ML.

The 8502 microprocessor in 128 mode is opcode-compatible with the 6502 and 6510, but can now run at two megahertz, twice the speed of the VIC-20's 6502 and Commodore 64's 6510. All VIC/64 Kernal routines are supported, making program translation much easier. New Kernal routines support special features of the 128, including routines for memory management.

A RESET button near the power switch can coldstart the machine. Holding down RUN/STOP with RESET initiates a "lukewarm" start. It's a more thorough reset than RUN/STOP-RESTORE, but still retains your BASIC program. This reset puts you into the machine language monitor, where you can exit back to BASIC with no harm done.

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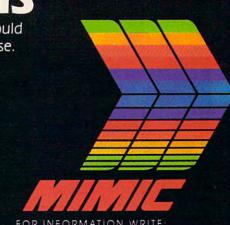
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Redefines any of the ten predefined music envelopes for the *tune* parameter of the PLAY command. The # specifies the envelope (0 to 9), followed by the values for attack, decay, sustain, and release. *Wave* sets the SID waveform and *width* selects the width of a pulse waveform.

FILTER freq, lopass, bandpass, hipass, res

Switches the SID filters for use with the *filter* parameter of the PLAY command. *Freq* selects the frequency; *lopass* the low-pass filter (0 = off, 1 = on); *bandpass* the notchreject filter (0 = off, 1 = on); *hipass* the high-pass filter (0 = off, 1 = on); and *res* the resonance (0 to 15).

espite the almost bewildering array of commands listed above, we've barely scratched the surface of BASIC 7.0. Indeed, a preliminary manuscript for the *Commodore 128 System Guide* is a stack of single-spaced, typewritten pages two and a half inches thick.

There are commands for windowing, switching 64K memory banks, renumbering BASIC programs, deleting ranges of BASIC lines, assigning new definitions to the predefined special function keys, entering the machine language monitor, trapping runtime errors and diverting execution to an error-handling routine at a certain line number, resuming execution after a runtime error, highlighting errors in BASIC lines, constructing loops without FOR-NEXT, and inserting delay loops. Plus additional commands for sprites, sound, music, and graphics that we didn't have room to mention.

Commodore BASIC 7.0 is a predictable step in the evolution of high-level programming languages for personal computers. It continues the trend away from low-level instructions such as PEEK and POKE—vestiges of machine language—and further shields users from intimate contact with the bits and bytes of computer circuitry. Yet, unlike some other personal computers introduced in recent years, the Commodore 128 retains its BASIC as a built-in feature and also provides a machine language monitor for those who want to explore the computer at every level. It's a welcome combination.

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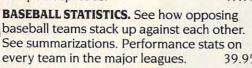
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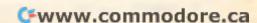


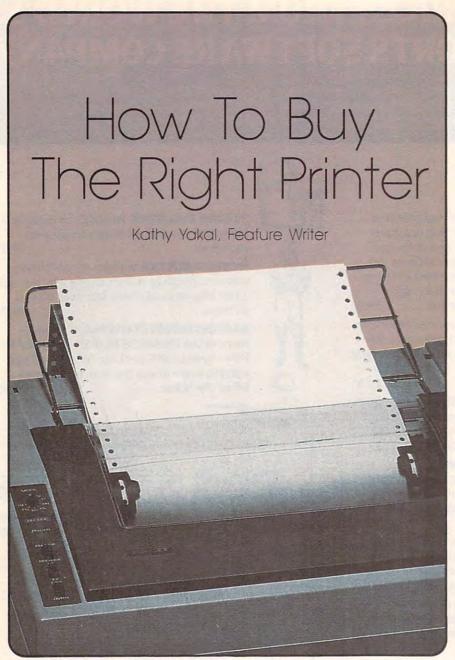
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Choosing a printer may be the most difficult decision you'll make when assembling your computer system. Even if you're planning to use it only for personal letters and program listings, there are more alternatives to consider than with any other peripheral.

nce you buy a computer, selecting a tape or disk drive and a monitor isn't too tough. There aren't that many choices. Modems are a bit more difficult because of the number available, but their features and

performance don't vary all that much.

Printers, however, are another story. There are dozens of printers which are inexpensive and produce good quality print. And they're complicated pieces of machinery. "As opposed to a computer, which has relatively few mechanical or moving parts, printers are the biggest mechanical piece of your computer system," points out Dave Crowley, corporate communications specialist for Centronics.

"Consumers have to be aware that if there is going to be a problem, it probably will happen in the printer rather than anywhere else in the computer system." Further, everyone's needs are different. Some people just want to print out program listings. Others want to print school papers or personal letters or business correspondence, or pictures created with light pens or graphics tablets. The goal is to find a printer that has everything you need without spending lots of extra money for features you'll never use.

he first step in buying a printer, then, is to determine exactly what you need. "We always recommend that someone sit down and draw up a list of items that the printer will be used for, and take that with them to the dealer," says Crowley.

Here's a list of questions, compiled with the help of Crowley and Star Micronics Marketing Director Tom Bongiorno, that you might want to ask yourself before visiting computer dealers:

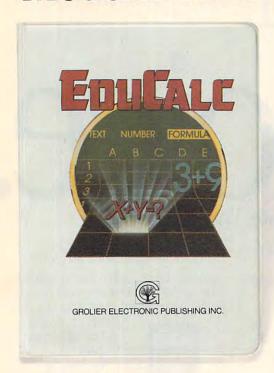
 Will this printer work with my computer? And if it doesn't, is the dealer knowledgeable enough to help you figure out how to make it work? Compatibility should be assured.

Printers for personal computers are designed to work with two general types of interfaces: parallel and serial. For the purposes of hooking up a printer, either works just as well. The most common parallel interface is often referred to as a Centronics-standard interface, and the most common serial interface is called the RS-232. If your computer doesn't have one of these interfaces built in, you may need to buy an interface adapter in addition to a printer. In any case, make sure the printer you buy is compatible with the interface available on your computer.

Many printer manufacturers offer cables that connect directly to, say, a Commodore 64 or an Atari. Buying such a printer frees you from compatibility worries for now, but may also restrict its future use if you someday buy a different system. Some printers allow interfacing through either a standard or a machine-specific port; these provide greater flexibility for use with other computers.

Consider software compatibility, too. Even if you're going to use

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Legend, The Clear

You can choose from several types of printers. They're available from more than 50 manufacturers. With and without graphics. In high speed and low speed models at prices ranging from less than \$200 to well over \$2,000.

How do you know you made the right choice?

Here's some easy-to-understand facts from Legend to help you make a "clear choice."

Legendary Legibility.

There are trade offs in buying printers. Simply stated, within a given price range, quality, or legibility, decreases as speed increases.

The object is to find the printer that

gives the the speed legibility you want at type that is a VS.

Legend printers have nihe-wire heads and fast double-strike capability to maximize speed and quality.

you need and at the price you can afford, like a Legend.

Dot matrix type printers are the most popular and lowest cost printers. Most combine high speed with acceptable quality and legibility. They're extremely versatile and very dependable.

Legendary Head.

Dot matrix printers have print heads containing tiny pins that "fire" against a ribbon to make a series of dots that combine to form letters, numbers and graphics. Generally, the more pins or "wires," the closer together the dots, and the better the legibility.

Choice

How Do You Know You Chose The Right Printer?

Legend printers have "full nine wire" heads for better legibility.

Many dot matrix printers produce type that is acceptable for about 95% of

all correspondence—invoices, letters, and the like.

Daisy Wheel or "letter quality" printers run one fifth as fast and cost twice as much as a Legend. So a Legend dot matrix printer makes better sense. Why? Read on.

Legend's

Square Dots

Easy to Switch.

Many dot matrix printers have a "double strike" capability that reduces the speed, but produces better legibility.

Unfortunately, with most dot matrix printers, changing to the double strike mode is difficult. And, unlike Legend, most other printers only run at 25% of their normal speed.

Legend printers have a higher legibility special, easily accessible switch on the top of the machine so double strike

capability (Legend calls it "damn near letter quality") is at the operator's fingertips. And machine speed stays at a



50% of normal speed.

very productive

Square Vs. Round.

In addition to speed, the shape of the dot affects the

legibility of type, too.

Competitors'

Round Dots

Square dots butt better for

Most printers use round dots. Legend printers use square dots because they butt better and fool the eye into thinking that lines are continuous.

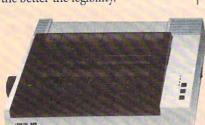
Think of it this way. Imagine you stack a series of baseballs next to a series of equal sized blocks. Now move back 20 paces and look at the two

stacks. Which one would look most like a straight line?

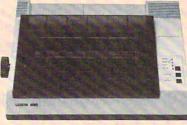
Legendary Graphics.

A picture is indeed worth a thousand words. And today's sophisticated software

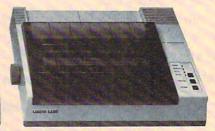
packages are making it easier to translate data into graphics that communicate quickly and clearly.



Legend 880-100 cps/80 col.



Legend 1080-140 cps/80 col.



Legend 1380—160 cps/80 col.



Unfortunately, not all printers are capable of running graphics software, including some of the more popular models. If your application includes charts, graphs or other kinds of symbols, it's important that you pick a printer that is compatible with the software and capable of printing graphics, like Legend.

Legend printers are compatible with almost all popular graphics software programs. What's more, you'll get more characters built into memory when you choose a Legend.

More Graphics.

Most comparably priced printers feature 96 to 196 characters (symbols) built into memory. Legend printers have 228.

Legend printers have 228 charac ters in memory to produce more graphics and more languages.

so you can produce more graphics and more languages (French, German, Greek, Spanish, Italian) so you can be more productive. And isn't that the bottom line, really?

Legend's advanced square dot technology will make your charts and graphs look sharper, too.

A Head For Life.

No printer at any price is worth its salt if it's not dependable. Legend's square dot heads use a special alloy that maintains a sharper image and a longer life. So all Legend printers come with a lifetime head warranty.

If anything ever goes wrong with the head, simply send it back for an immediate exchange. It's so simple, it's legendary.

Legendary Value. If there's still any doubt in your mind about which printer is best for you, we'll make your decision even

easier.

Legend printers also come with standard friction and tractor feed and are

> compatible with most computers.* They fea-

ture over 40

software selectable type styles and make a crisp original plus

three copies.

Most remarkable of all, prices start at just \$279. And for just \$1 you can get a special buffer upgrade. Compare if you like, but we'll bet you'll find Legend Printers, feature-for-feature, to be clearly the best value for your money today.

Call 1-800-4-LEGEND today for more information and visit your dealer

to see them in action.

Dealer inquiries call 1-800-321-4484. In CA call (818) 704-9100. Or write CAL-ABCO Peripherals Division, 6041 Variel Avenue, Woodland Hills, CA 91367.

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*Legend Printers can be interfaced with most computers, including: Apple® II, IIe, IIc, Atari;® Columbia® 1600 series; Compaq,™ Commodore,® Compaq Plus;™ DeskPro; [™] Eagle PC and Spirit, Turbo; Hewlett Packard 110, 150; IBM PC, XT, AT; Kaypro; Sanyo; TI Professional; TRS.



the printer only to print out correspondence and home records, make sure the printer will accept your word processor's formatting commands.

 How good does your printed copy need to look? Different kinds of printers offer varying type qualities.

Impact printers (daisy wheel and dot-matrix) strike the paper through an inked ribbon to form characters and graphics. Daisy wheel printers are capable of producing letterquality type because the characters are stamped onto the paper by a print wheel that works much like the strikers on a typewriter. Dotmatrix printers, on the other hand, have printheads with dozens of tiny metal pins that reproduce characters and graphics by printing tightly packed patterns of dots. Some dotmatrix printers, depending on the numbers and placement of pins, can produce near letter-quality print.

Thermal printers don't use an ink ribbon—they burn characters and graphics onto special paper coated with a heat-sensitive film. They're relatively inexpensive and quiet compared to other printers, but the special paper costs more. Thermal transfer printers, however, can print on any kind of paper.

Ink-jet printers, the third kind found in the under-\$1,000 price range, spray ink through tiny holes to reproduce characters.

"You should always look at the output of the printer—get a demo—because draft mode or near-letter quality from three different printers will always differ," says Bongiorno. "If you like the typeface on one printer better than another, then to you the quality will be better, and that's the one you should buy."

- Are there hidden costs? Printers that require special paper or additional interface cables can make that under-\$300 printer move closer to the \$400-plus range. If the printer uses a ribbon, what is its average life? Can it be re-inked?
- What type of paper handling does the printer use? Printers can move paper around the platen in two different ways. Friction-feed printers work like typewriters; they grip one sheet at a time and roll it through. Tractor-feed printers use a pair of cogged wheels to grip holes punched into the edges of special

printer paper. The paper comes as a long, continuous form with perforated pages, and the holes along the edges are also perforated for removal. The tractor wheels can be adjusted to accommodate different paper sizes and special forms, such as mailing labels. (A printer with non-adjustable tractors is called a pinfeed printer.)

Some printers offer both friction- and tractor-feed by including snap-on tractors. This gives you the option of printing correspondence on letterhead stationery, or printing

continuous forms.

- How easy is it to obtain parts? Daisy wheels, for example, sometimes break after heavy use. Can you run down to a local office supply store to replace the wheel, or will you have to order it by mail and wait six weeks for delivery? If the printhead on a dot-matrix printer burns out, can it be replaced without exchanging the entire printing mechanism? How economical are replacement ribbons? If you buy a thermal printer, is the special paper readily available?
- How good is the warranty? Opinions vary on what constitutes a fair warranty period, but, in all cases, find out what it is. Bongiorno believes that one year is fairest. "If something is going to go wrong, it will go wrong within the first year," he says. "Sometimes the warranty on the printhead is different than the printer, which you have to be careful of."
- Can the printer produce the kind of graphics you need? You may not need graphics at all, of course, but if you do, there are basically two types of graphics that printers can produce. With block graphics, the printer recognizes a block of dots as a symbol or special character. It constructs the picture by assembling these symbols. With dot-addressable graphics, each tiny dot can be individually printed, so the printer isn't limited to a set of predefined block graphics patterns. If you need to reproduce high-resolution drawings, charts, or diagrams, you'll probably need a printer with dotaddressable graphics. It will also have to be a dot-matrix printer, because daisy wheel printers aren't capable of producing detailed graphics.

Ithough these are the major concerns, there are myriad other questions you'll want answered when shopping for a printer:

How fast is it? Printer speeds are usually measured in characters per second, abbreviated cps. Dot-matrix printers are generally much faster than daisy wheel printers in the same price range, but remember that speeds can vary in different printing modes.

How noisy is it? For home use, this might be critically important if your computer shares a family room with the TV.

Does it have a buffer? How large? A printer buffer is an area of memory inside the printer that lets it print your material while freeing up the computer for other tasks. To be useful, a printer buffer should be at least as large as the files you need to print. For instance, if you'll frequently be printing documents about 16K long-roughly eight double-spaced pages-the printer buffer should contain at least 16K of memory. To keep initial costs down, you can often buy a printer without a buffer and add the memory later. Also, printer buffers are available as separate devices that connect between a computer and any standard printer.

Can the printer produce special type styles, like italics, boldface, condensed, expanded? Keep in mind that even though a printer offers special fonts, your software may not be capable of sending the proper codes to take advantage of these features. This is a tricky problem that can only be solved by carefully comparing the software manual with the printer manual.

Can I afford it? The bottom-line question.

A good computer dealer, says Crowley, will take the time to answer all of your questions and run the printer through its paces, just as a good car dealer will take you out for a test drive. "I've actually gone in to buy a car and gotten a salesman who couldn't tell me whether it had six or eight cylinders," he says. "If you run up against somebody who's not willing to take the time, then take your business someplace elsebecause there are plenty of people who are willing."

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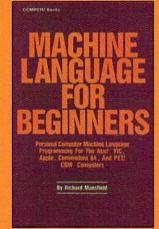
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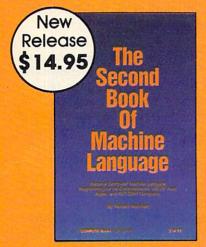
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Solving Common Printer Problems

Selby Bateman, Features Editor

Few things in computing are as frustrating as a recalcitrant printer. Here are some tips on how to find relief.

t one time or another, every computer user looks at the paper rolling out of a printer and sees something that seems to have been sent from an alternate universe. *That's* not what I told my computer to print!

Your neatly formatted double-spaced letter is being printed all on one line. Or your beautiful four-color screen illustration is appearing on paper as a series of capital E's. The italics and underlining you've added for emphasis in a report have changed the rest of the words to an unknown foreign language. Or, perhaps most depressing, the paper is simply rolling out of your printer completely blank.

Nine times out of ten, your printer problems won't be mechanical in nature. More likely, they'll fall into one of two major areas, which we may call <code>interface/configuration</code> mistakes and <code>special effects</code> errors.

Problems with interfacing and configuring your computer and printer usually happen during your first attempts to connect everything together. But confusion over special effects—such as boldfacing, underlining, super- and subscripting, and graphics—can happen even to the most advanced computer user.

No matter what the cause of a printer problem, it is a frustrating experience. Yet, with some patience and a thorough understanding of how the computer, printer, software, and printer interface work together, you can unleash all of the power and high-quality performance packed into today's printers.

hether your computer is a Commodore, IBM, Apple, Atari, TI, or other brand, you should become familiar with how it connects to a printer. Often an extra interface is required to allow an otherwise incompatible printer and computer talk to each other.

A thorough discussion of the many printer interfaces for microcomputers could fill a book. But basically, your data will be sent from computer to printer either in a serial or parallel stream, one bit at a time or eight bits at a time. Most printers use the parallel method. Your computer and printer manuals will tell you which kind of interface to use. But you should also know that some computers require additional accessories to work with certain printers.

For example, the Apple II needs an interface cable and either a parallel or serial interface card. IBM PCs need either the standard printer interface card for parallel connection or an asynchronous serial card. A Commodore 64 can hook directly to Commodore printers to make use of the special graphics symbols and reverse-video characters, but if you want to print special character sets, different type fonts, or foreign language characters, you'll need other printers and appropriate interfaces. Similarly, Atari computers hook up

directly to Atari printers, but require the 850 Interface Module or a substitute to work with other printers.

That super-low-priced printer might not look like such a bargain when you arrive home and find that you not only need an additional \$35 cable but also a \$100 add-on interface. Although most stores selling printers have salespeople to help answer your questions, you should still do your homework with computer manuals, magazines, and books.

To add to the confusion, the application software you want to use—such as a word processor or graphics program—can add its own complications. Unless you configure your system correctly, what you end up with may be quite different from what you want.

or example, let's say your interface automatically sends a linefeed instruction which tells the printer to advance the paper. Your word processing program may already contain a similar command. And the printer, unless adjusted, may automatically add a linefeed as well. As a result, when you try to print out a single-spaced letter, the printer may be following instructions to put two or three linefeeds between each line of print. Conversely, you could also end up with no linefeeds at all. The entire letter might be printed on a single line.

The solution, of course, is to enable or disable the linefeeds, depending on the problem. This may involve opening up the printer or interface to flip a switch, or issuing the appropriate command with the word processor program. The answers are buried somewhere in the manuals.

Once you've got the printer and computer connected properly, you'll eventually want to take advantage of the advanced options which printers now offer. The special effects which turn your system into so much more than a typewriter are theoretically quite easy to control. The complexity stems, once again, from all the configuration possibilities. Versatility has a price.

Let's consider an example using the *SpeedScript 3.0* word processor recently published in COMPUTE! for Commodore, Atari, and Apple computers. To underline a word with



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Communication in the care

SpeedScript, you send a control code to the printer which backspaces and underlines after each character. But to Commodore 1525 or 801 printers, the code that most other printers understand as backspace is read as a command to enter graphics mode. Such conflicts are unavoidable, because there are so many different printers and control codes.

hether you're just getting started with printers or are moving on to advanced printing features, there are a few basic concepts you should understand. If you're having printer problems, check this list to be sure you're familiar with each item. If you're not, invest some time exploring your computer, printer, software, and interface manuals to find a solution.

• ASCII (pronounced "AS-key"). American Standard Code for Information Interchange. A code that uses numbers from 0 to 127 to represent letters, numbers, punctuation symbols, and special control codes. Each code number consists of seven bits (binary digits). An eighth bit may be added for parity (see below). The first 32 ASCII numbers are control codes which can tell your printer to perform actions such as linefeeds, carriage returns, backspaces, and vertical and horizontal tabs.

Commodore and Atari computers use a slightly different form of ASCII which can cause translation problems with some interfaces and printers unless they are correctly configured.

- Baud rate. A measure of data transmission speeds, synonymous at lower speeds with bits per second. Computers can send data much faster than printers can produce images on paper. Consequently, the printer and interface must tell the computer to send data in bursts short enough for the printer to handle.
- Buffer. In a printer or interface, the memory area in which data is held after being sent from the computer. Printer buffers can be as small as one line of characters or range upward to thousands of bytes of data. If the buffer is large enough, it can hold all of the data you want to print, thus freeing the computer for other tasks while the printer goes about its work. The printer controls

the speed at which the data leaves the buffer and is printed on the paper.

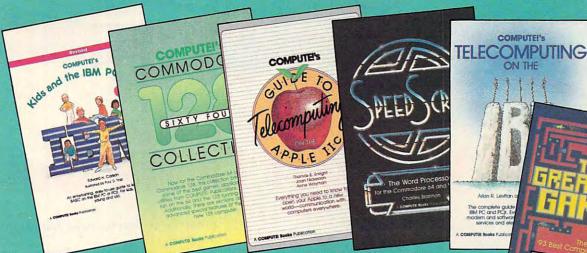
- Centronics-standard parallel connection. A printer interface which allows data to be sent along separate wires eight bits at a time in a parallel flow. Most printers use a parallel interface to receive data from the computer. Some computers, however, must transmit data through a serial interface (see RS-232-standard serial connection). The Centronics interface, named after the printer company which popularized it, is the most common type of parallel interface on personal computers.
- Character set. The letters, numbers, and symbols which a printer or computer can produce. Note that many computers can display characters which the printer cannot reproduce, and vice versa. Some printers are capable of printing foreign character sets when you change the DIP switch settings. (See DIP switches).
- Control codes. Nonprintable commands sent from the computer to a printer for special actions, such as backspacing, carriage returns, linefeeds, tabs, and margin settings.
- DIP switches (Dual In-line Package). Small switches located on a printer or interface which can control a variety of options, such as baud rates, automatic/manual linefeeds, printing impression levels, international character sets, types of paper, form lengths, line spacing, and other parameters. Some printers and interfaces allow easy access to DIP switches, while others require you to take apart the case.
- Emulation. In terms of printers, a mode of operation which mimics another type of operation. For instance, some printer interfaces let a non-Commodore printer emulate a Commodore printer, allowing you to print the computer's special graphics symbols and reverse-video characters.
- Escape codes. Control code sequences which let you print certain characters not included in ASCII codes, or which activate special printer features such as boldfacing, italics, expanded or condensed type, and so on. Escape sequences are preceded by the escape character, ASCII 27. These sequences can be

sent to the printer in BASIC from your computer keyboard, or by the application software (such as a word processor). For example, ESC H might represent a British pound sign, ESC P might turn on or off the proportional spacing option on your printer, and ESC BS may determine the amount of space between characters in backspacing.

- Firmware. Software permanently burned into a ROM chip (Read Only Memory)—a cross between hardware and software. Printers contain firmware to control their printing options. Sometimes you can replace this chip with another to add more printing features.
- Parity. A way for your computer and printer to check the accuracy of the data being sent. An extra bit is added to the end of a seven-bit ASCII code representing a particular character. The computer checks the extra bit to verify that the data was not scrambled during transmission.
- Proportional spacing. Many printers today can vary the spacing between characters, as typesetters do. Typewriters have fixed spacing between all letters. For example, proportional spacing allows more room for a capital M or W and less room for a lowercase i or l.
- Protocol. All the rules and instructions controlling the way in which data is sent and received between the computer and printer.
- RS-232-standard serial connection. A type of interface that transmits data along a single wire one bit at a time, or serially. Although most printers use a parallel interface to receive data from a computer, some computers and printers require a serial interface. When all other factors are equal, a serial interface is slower than a parallel interface—but this is rarely important with printers, whose speeds are determined by mechanical limitations anyway.
- Tractor-feed. A pair of cogged wheels and guide wires that helps continuous-form paper roll through a printer. Some computers have built-in tractors, and others offer them as options.
- Transparency. A mode of operation for printer interfaces in which serial data is changed to parallel data without converting the original values of the data.

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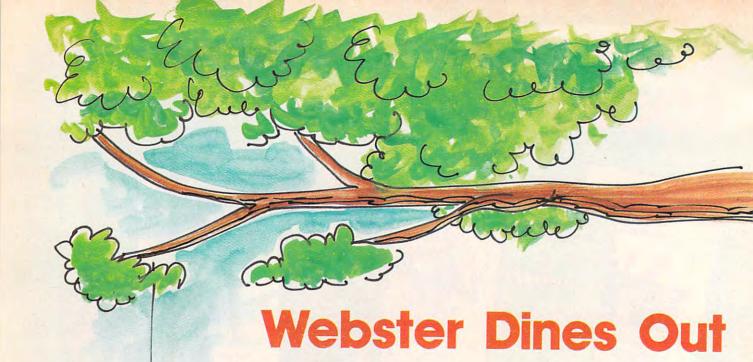
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> abc



Walter Bulawa

Tired of blasting invaders from outer space? This whimsical game is set in a very different world—the miniature jungle in your own backyard. The original version was written for the Atari. We've added versions for Apple, TI, Commodore 64, VIC-20, and IBM PC and PCjr computers. A joystick is required for the Atari and Commodore 64 versions.

Guide Webster, the hungry tree spider, in his endless search for a square meal. Roving back and forth across his tree limb, he watches for bugs to appear in the grass below. When the time is right, he drops down on a strand of silk for a light snack, then climbs back up his web to look for more.

Unfortunately, this backyard paradise isn't quite perfect. The more Webster eats, the faster the bugs move, making it harder to find the next meal. Even worse, he's not the only one with an appetitethere's a speedy scorpion sharing the same hunting ground, stealing bugs when he can and giving Webster a sting whenever he drops too close.

Atari Version

Program 1—the Atari version of "Webster Dines Out"-will run on any Atari computer with at least 32K memory. Use the joystick to move Webster left or right at the top of the screen. When a bug passes below,

press the button to make him drop down.

Your goal is to score points as quickly as possible. Each bug is worth 25 points and you get 50 bonus points for snaring two bugs in a single drop. Webster has three lives in each game; getting stung by the scorpion costs you a life but does not reduce your score. The scorpion is a tough competitor: When Webster drops down, the scorpion speeds up to increase his chances of stealing a

There are six skill levels, each harder than the last. As you advance to higher levels, the bugs and scorpion speed up, the grass grows longer, and a grey rock appears in the lawn. The other creatures hide behind these objects, but Webster can drop behind them too. The game ends when you lose all three lives or exhaust your time at the highest skill level.

Commodore 64 And VIC-20 **Versions**

Both Commodore versions of Webster Dines Out are scored like the Atari game—25 points for each bug, with a 50 point bonus for capturing two at once. You begin with three lives, and lose one each time you collide with the scorpion.

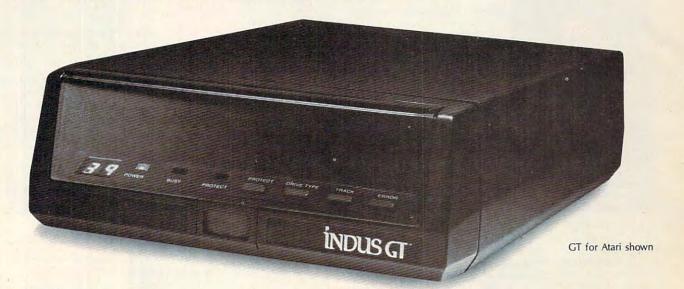
The 64 version (Program 2) is played with a joystick in port 2. The bugs and scorpion move across a sloping, multicolored lawn; at higher skill levels, colorful objects grow up to obscure your view of the

ground. Play ends when your lives Cwww.commodore.ca



COMPUTEI June 1985

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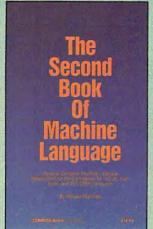
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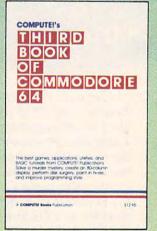


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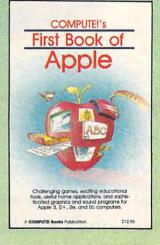
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are used up or time runs out at the last skill level.

The VIC-20 version of Webster Dines Out is written in machine language (ML) for the unexpanded VIC. Program 3 is a BASIC loader that saves the ML program on disk or tape. Since the loader won't fit in an unexpanded VIC, you'll need at least 8K memory expansion to run it (a Commodore 64 can also be used; see instructions below). Type in and save Program 3, but don't try to run it yet. Enter this line in direct mode (without a line number):

POKE6609,0:POKE43,209:POKE44,25: NEW

Now reload Program 3 and run it. Press D to save the game on disk, or T to save it on tape. The finished program will be named WEBSTER (replacing any other program of that name on your disk). If you don't have memory expansion, you can use a Commodore 64 to create the VIC game (of course, the game itself runs only on a VIC). To run the loader on a 64, change the 57809 to 57812, and 63109 to 62957 in lines 9–11 of Program 3. Then follow the procedure described above.

Once the game is saved, remove any memory expansion and load and run it like a BASIC program. Move Webster with the < and > keys, and drop him down by pressing the space bar. As you progress to higher skill levels, the speed increases, and rocks appear below, blocking your vision. You can snare bugs from behind the rocks, but be careful not to drop onto a hidden scorpion. Play continues until you lose all three lives.

IBM Version

Program 4 runs on any PCjr with cartridge BASIC and any IBM PC with BASICA and a color/graphics adapter card. Press the left and right cursor keys to move Webster, and the space bar to drop.

Webster's lifeline is displayed at the top of the screen. When you drop to get a bug, your energy level is drained and your lifeline shrinks. Capturing a bug restores your energy and expands your lifeline. You'll score 10 points for catching a beetle, and 20 for each bug, with bonus points for multiple captures. Extra bonus points are awarded at the 1,000, 5,000 and 10,000 point marks. As your score increases, the

bugs speed up and become more scarce; your energy will drain faster, too. The game ends when you hit the scorpion or your energy drains to zero.

Apple Version

This version of Webster Dines Out will run on any Apple II series computer. Since it's written entirely in machine language (ML), it must be entered using the "Apple MLX" machine language editor found elsewhere in this issue. MLX will greatly simplify the usually tedious job of accurately entering the many numbers that make up a ML program. But be sure that you read the MLX article and understand how to use MLX before you begin entering the data from Program 5.

When you run MLX, it will ask for a starting and ending address. Use the values indicated in Program

START ADDRESS? 1100 END ADDRESS? 1F14

MLX will then give you a menu of options. Choose E for enter and give 1100 as the starting address. A prompt for the first line will appear, and you can begin entering the data from Program 5. If you don't type the entire listing in one sitting, follow the instructions in the MLX article for saving a partially complete version and reloading it later. When you're finished typing, MLX will prompt you for a filename for the completed machine language program. To load and run the game, simply type BRUN"WEBSTER" (or whatever name you used for the completed program) and press RETURN.

The scoring is identical to the Atari version. Use the left and right arrow keys to move on the branch, and press the space bar to drop to the ground. Avoid colliding with the giant grasshopper—when that happens, Webster loses a life (and is carried bodily off the screen). The grass in the lawn grows higher as the game progresses, making your job more difficult. You can drop into the grass to snare a hidden bug, but be sure to keep track of the giant hopper, who might be lurking there as well.

TI Version

This version of Webster (Program 6) uses sprites for the spider, bugs, and

scorpion, and thus requires TI Extended BASIC. You can use either joystick or keyboard controls. For the keyboard, press the S key to move left, the D key to move right, and the space bar to make Webster drop. Scoring is identical to the Atari version: You have three lives in each game, and six possible levels. Bugs are worth 25 points, with a 50 point bonus for catching two at once.

At the bottom of the screen you'll see Webster's lifeline. Dropping for a bug drains your energy and shrinks the lifeline; catching a bug restores your energy to normal. You lose a life whenever your energy drains to zero or you hit the scorpion. The game will not end until you lose all three lives.



Growing grass and grey rocks make it tough for Webster to find a meal in Atari "Webster Dines Out."

Program 1: Webster Dines Out For Atari

Please refer to "COMPUTEI's Guide to Typing In Programs" before entering this listing.

- KI 1Ø GOSUB 7ØØØ

 KK 2Ø GOSUB 71ØØ

 LA 3Ø GOSUB 76ØØ

 00 5Ø LEVEL=LEVEL+1

 CL 8Ø ON LEVEL GOSUB 85,1ØØØ
 Ø,1Ø1ØØ,1Ø2ØØ,1Ø3ØØ,1Ø
 4ØØ,19ØØØ

 PL 85 POKE 656,2:POKE 657,8:
 ? LEVEL

 LH 9Ø POKE 53248,XPOS:PDØ\$(Y
 POS,YPOS+LEN(SPIDER\$))
 =SPIDER\$

 PO 98 COUNTER=Ø
- DP 99 REM *** MAIN LOOP STAR T ***
- CA 100 S=STICK(0) NC 110 XPOS=XPOS+4*(S=7)-4*(
- S=11) 00 144 IF XPOS>XMAX THEN XPO
- S=XMAX NO 146 IF XPOS<XMIN THEN XPO S=XMIN

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EB 150 POKE 53248, XPOS DB 862 IF XB3=XB2 THEN XB2=Ø F711Ø DIM SPIDER\$(15) CM 200 S=STRIG(0) : POKE 53250, Ø HB 712Ø FOR I=1 TO 15 00 210 IF S<>0 THEN 400 HB 89Ø SOUND 3,Ø,Ø,Ø OF 713Ø READ X: SPIDER\$(I)=CH FN 211 REM ** WEBSTER LEAPS R\$(X) IK 899 RETURN CJ 212 POKE 53278, Ø FE 7140 NEXT I HD 1000 REM SPIDER HIT A BUG OC 214 VEL=XB3VEL: XB3VEL=VEL DATA 8,8,8,8,137,74, GE 715Ø (WHICH?) 12 60,255,60,74,129,0,0 GJ 1004 HIT=INT(HIT/2) FL 22Ø FOR I=YPOS TO YB-4 ST ,0,0 CP 1010 ON HIT GOSUB 1100.12 EP 4 MG 7152 LS=LEN (SPIDER\$) 00,1300,1400,1500,16 #P 24Ø PDØ\$ (I, I+LS) = SPIDER\$ 0 716Ø DIM BUG\$ (3) 00,1700 LF 244 SOUND Ø, I, 10, 4 ED 717Ø FOR I=1 TO 3 KD 1011 RETURN MN 246 IF XB3=Ø THEN FOR D=1 L6 1100 REM STATE THE THE CONTROL OF T AB 718Ø READ X: BUG\$(I)=CHR\$(TO 6: NEXT D: GOTO 250 Y) LJ 248 GOSUB 830 FJ 719Ø NEXT I IL 1120 SCORE=SCORE+25 HD 7200 DATA 28,62,42 BP 25Ø NEXT I BC 1125 GOSUB 1800 KE 7300 REM ** INTRO DISPLAY PI 260 HIT=PEEK (53260): IF HI KF 113Ø RETURN POKE 53248, Ø: POKE 53 249, Ø: POKE 5325Ø, Ø: P LB 7310 T<>Ø THEN GOSUB 1000 LI 1200 REM SPIDER ATE BUG 2 10 28Ø FOR I=YB-4 TO YPOS ST FN 1210 XB2=Ø:POKE 5325Ø, XB2 OKE 53251, Ø FP -4 IN 1230 SCORE=SCORE+25 0B 732Ø GRAPHICS 2+16 HM 300 PDØ\$(I, I+LS) = SPIDER\$ BE 1235 GOSUB 1800 ? #6:? #6:? #6:" CE 733Ø LC 3Ø4 SOUND Ø, I, 1Ø, 4 KH 1240 RETURN (6 SPACES) MESSES" MH 306 IF XB3=Ø THEN FOR D=1 NA 1300 REM EPIDER ATE BUSS ? #6:? #6:? #6; PE 7340 TO 6: NEXT D: GOTO 310 1 AND 2 (5 SPACES) DINES OUT AH 1310 GOSUB 1100 LE 3ØB GOSUB B3Ø BM 310 NEXT I AJ 1320 GOSUB 1200 LH 735Ø ? #6:? #6:? #6:? #6: 60 320 SOUND 0,0,0,0 IN 1330 SCORE=SCORE+50 "(4 SPACES)press SP 322 XB3VEL=VEL BF 1335 GOSUB 1800 art" FH 399 REM ** BUG 1 MOVEMENT KI 1340 RETURN F0 400 IF XB1<>0 THEN 430 N 1400 REM HETE BED BUG (3) PK 7379 REM ** PLAY MUSIC-AW 0P 41Ø X=INT (51*RND (Ø) -25) AIT START - TOO BAD PB 738Ø RESTORE 19100 86 414 IF ABS(X)<>1 THEN 500 DK 1410 FOR I=20 TO 200 STEP HD 7384 POKE 53279,8 PJ 418 XB1=XMIN* (X=1) +XMAX* (OK 1420 SOUND 0, I, 14,8 J6 739Ø FOR I=1 TO 73: READ X X = -1:SOUND 2, X, 10,8 EA 143Ø SETCOLOR 4, I, 8 EL 419 XB1VEL=X*XB1SPEED DH 1440 FOR N=1 TO 10: NEXT N # 7392 IF PEEK (53279) = 6 THE NC 424 PD1\$(YB, YB+LEN(BUG\$)) NEXT I POKE 656,1:POKE 657, FC 145Ø N POP : SOUND 2,0,0,0 =BUG\$: RETURN 6B 1455 NB 43Ø SOUND 1,3Ø,14,4 LIVES*2+16:? " NF 7394 FOR J=1 TO 7: NEXT J: EI 440 XB1=XB1+XB1VEL CJ 1460 SOUND Ø, Ø, Ø, Ø: SETCOL NEXT I LL 442 IF XB1<XMIN OR XB1>XM EB 7395 FOR J=1 TO 40: NEXT J OR 4,0,0 AX THEN XB1=Ø SN 147Ø LIVES=LIVES-1 DE 7396 GOTO 7380 M6 450 POKE 53249, XB1 LC 7600 REM GAME DISPLAY SEL KO 1480 IF LIVES<1 THEN GOTO 6L 49Ø SOUND 1,Ø,Ø,Ø 19000 UE FJ 499 REM ** BUG 2 MOVEMENT GRAPHICS 5 KO 149Ø RETURN FE 7610 68 500 IF XB2<>0 THEN 530 JC 1500 REM SPIDER ATE BUG 1 REM CLEAR COLLISION CL 7620 PA 51Ø X=INT (51 *RND (Ø) -25) AND BAD BUG REGISTER BI 514 IF ABS(X) <>1 THEN 600 66 1510 XB1=0:POKE 53249, XB1 6E 763Ø POKE 53278.Ø PL 518 XB2=XMIN* (X=1) + XMAX* (AN 1520 GOSUB 1400 NH 7640 REM SET PLAYER SIZES X = -1KJ 153Ø RETURN (2X) E0 519 XB2VEL=X*XB2SPEED MH 7650 POKE 53256, 0: POKE 53 JE 1600 REM SPIDER ATE BUG 2 NE 524 PD2\$ (YB, YB+LEN (BUG\$)) 257, Ø: POKE 53258, Ø: P AND BAD BUG =BUG\$ 68 1610 XB2=0:POKE 53250, XB2 OKE 53259,1 NC 53Ø SOUND 2, 11, 14, 4 A0 1620 GOSUB 1400 EC 7660 REM SET PLAYER COLOR EN 540 XB2=XB2+XB2VEL KK 163Ø RETURN LP 542 IF XB2<XMIN OR XB2>XM J6 7670 POKE 704, 10: POKE 705 DH 1700 REM SPIDER OF ALL AX THEN XB2=Ø .255: POKE 706, 148: PO MA 55Ø POKE 5325Ø, XB2 KE 707, 255 61 171Ø XB1=Ø: POKE 53249, XB1 6N 59Ø SOUND 2,Ø,Ø,Ø GD 1720 XB2=0:POKE 53250, XB2 HN 7680 REM ENABLE P/M GRAPH FL 599 REM ** BUG 3 MOVEMENT BA 1730 GOSUB 1400 ICS 6E 600 IF XB3<>0 THEN 630 KH 174Ø RETURN 6M 769Ø POKE 53277,3 BD 610 X=INT(F1*RND(0)-F2) AM 1800 REM TIPDATE SCORE HG 7700 REM SET 2-LINE GRAPH BE 614 IF ABS(X) <>1 THEN 100 JE 1810 POKE 656, 2: POKE 657, ICS PJ 616 COUNTER=COUNTER+1: IF 32 DH 771Ø POKE 559,46 COUNTER>15 THEN POP : LG 7720 REM TURN OFF CURSOR NE 1820 PRINT SCORE KN 1830 SOUND 0,40,12,8:FOR PM 7722 POKE 752,1 GOTO 50 PN 618 XB3=XMIN* (X=1) + XMAX* (I=1 TO 10:NEXT I:SOU FP 774Ø REM ZERO OUT CHARS X = -1ND Ø, Ø, Ø, Ø BB 775Ø PDØ\$=CHR\$(Ø):PDØ\$(12 FB 619 XB3VEL=X*XB3SPEED LL 1899 RETURN 8) = CHR\$ (Ø) : PDØ\$ (2) = P NG 624 PD3\$ (YB, YB+LEN (BUG\$)) DØS ND 7000 REM ETFERT: | 中中4:201 HF 7760 PD1\$=PD0\$:PD2\$=PD0\$: = BUG\$ KA 7010 DIM X\$(1) PD3\$=PDØ\$ LE 630 GOSUB 830 0L 7020 A=ADR (X\$) B=INT((A-512)/1024+1 DK 7809 REM ** INITIAL SPIDE GOTO 100 BP 7030 68 700 R LOCATION EE 702 REM *** END OF MAIN L) *1024 XPOS=100:YPOS=21 NC 7040 DIM F\$ (B-A+511) AN 7810 DOP *** DIM PDØ\$(128),PD1\$(1 BC 7811 YB=90 REM ** MOVE BUG 3 CD 829 IA 7050 SOUND 3,5,8,4 28), PD2\$(128), PD3\$(1 60 7812 REM ** INIT BUG POS HM 830 & VELS 28) FC B4Ø XB3=XB3+XB3VEL PD 7814 XB1=Ø: XB2=Ø: XB3=Ø MF842 IF XB3<XMIN OR XB3>XM HN 7060 POKE 54279, INT (B/256 KK 7816 XB1VEL=Ø: XB2VEL=Ø: XB AX THEN XB3=Ø MF 850 POKE 53251, XB3 DF 860 IF XB3=XB1 THEN XB1=0 3VEL=Ø LJ 7099 RETURN FB 7817 XB1SPEED=1: XB2SPEED= HB 7100 REM CONSTRUCT CHARAC 1: XB3SPEED=6 नावःस : POKE 53249, Ø

PO 7818 XMIN=42: XMAX=200	01 10200	REM ** EUEL 4 ADJUS	Program 2: Webster Dines
EB 7820 F1=51:F2=25 60 7900 REM DRAW BROKEROUND		N=10:HEIGHT=2:GOSUB	Out For Commodore 64
U 7912 SETCOLOR Ø, 12,6:SETC OLOR 1,14,2:SETCOLOR		12000 N=10:HEIGHT=3:GOSUB	Translation by Jeff Hamdani
2,0,6		12000 RETURN	Please refer to "COMPUTEI's Guide to Typing In
6M 7913 REM ** DRAW LAWN IF 7914 COLOR 1		REM **[EVEL 5 ADJUS	Programs" before entering this listing.
00 7920 PLOT 0,38:DRAWTO 79, 38:PLOT 0,39:DRAWTO		F1=21:F2=10	100 GOSUB1130:GOSUB1150:GOSUB1
79,39 J0 7928 COLOR 2:PLOT 44,7:DR		N=10:HEIGHT=3:GOSUB	190:GOSUB1580:GOSUB1370 :rem 233
AWTD 60,2	06 10399	RETURN REM **[EUEL 6 ADJUS	110 LV=LV+1:CR=0:IFLV=7THEN149 0 :rem 135
P7930 COLOR 2:POKE 765,2:R ESTORE 7940		TMENTS	120 ONLVGOSUB130,1400,1450,146 0,1470,1480:IFCR>10THEN110
ND 7932 FOR I=1 TO 4: READ X,		XB1SPEED=4: XB2SPEED =4: XB3SPEED=8	:rem 115
Y:PLOT X,Y 6K 7933 FOR N=1 TO 3:READ X,	KM 1Ø42Ø	N=10:HEIGHT=3:GOTO 12000	130 POKE214,6:PRINT:POKE211,35 :PRINTLV :rem 125
Y:DRAWTO X,Y LC 7934 NEXT N:READ X,Y:POSI		F1=17:F2=8 RETURN	140 POKE214,20:PRINT:POKE211,3 3:PRINTSC :rem 156
TION X,Y:XIO 18,#6,0 ,0,"S:":NEXT I		REM ** TO DRAW SOME	160 P=PEEK(56320):D=15-(PAND15) :rem 194
JA 7940 DATA 74,30,79,30,79, 37,71,37,74,30,74,7,		TALL GRASS COLOR 1	170 XP=XP+8*(D=4)-8*(D=8)
79,7,79,30,74,30,74,		FOR I=1 TO N X=INT(80*RND(0))	:rem 81 180 YP=INT((208)*XP+227.2)
7,70,0,73,0,79,7,74, 7,70,0,77,0,79,0		PLOT X,37: DRAWTO X,	:rem 249 190 IFXP>226THENXP=226 :rem 87
LE 7942 DATA 79,7,77,5,77,0 E6 7946 PLOT Ø,0:DRAWTO Ø,2:		37-HEIGHT NEXT I	200 IFXP<25THENXP=25 :rem 231
POSITION Ø, Ø: XIO 18,		RETURN REM # END GRME & EE	210 POKEV, XP:POKEV+1, F:rem 121 220 FR=PAND16 :rem 243
#6,0,0,"S:" EE 7949 REM ** PLOT TREE LEA		POKE 53248, Ø: POKE 5	230 IFFR<>0THEN400 :rem 41 240 VE=V3:V3=VE/2:POKET1,17
VES IF 7950 COLOR 1		3249, Ø: POKE 53250, Ø	:rem 117
AA 7952 RESTORE 7954:FOR I=1 TO 24:READ X,Y:PLOT		:POKE 53251,Ø GRAPHICS 2+16:? #6;	250 XX=INT(XP/8)-1:FORI=FTOYPS TEP8:POKEV,XP:POKEV+1,I
X,Y:NEXT I LD 7954 DATA 1,3,1,4,2,3,3,4		"{5 SPACES}game ove r ":? #6:? #6;"	:rem 253 260 O=1064+XX+Z:POKEH1,I:POKEL
,3,5,7,2,2,2,7,3,8,4		(4 SPACES) SCORE : " ;SCORE:? #6	1,(I/3) :rem 180 270 POKEO,66:POKEO+CL,6
,3,2,6,2,10,2,3,0,4, 0,4,1,4,2,5,0,6,0,6,		? #6:? #6;" [[]]]	:rem 131
2,7,2,45,8,44,5,45,6 ,58,4	FP 19030	R LOVES YOU" ? #6:? #6:? #6:? #6	28Ø IFB3=ØTHEN3ØØ :rem 2Ø5 29Ø GOSUB75Ø :rem 183
AC 7980 POKE 623,4 AD 7990 LIVES=3:LEVEL=0:SCOR		; "(6 SPACES) ETTERPEDE	300 Z=Z+40:NEXTI :rem 213 310 A=PEEK(V+30)AND15:IF(AAND1
E=Ø F07992 POKE 656,1:POKE 657,	BN 19040	RESTORE 19100 FOR I=1 TO 73:READ)=1 THENGOSUB860: IFLS=0THEN
10:? "LIVES		X SOUND 2, X, 10,8:FOR	POKET1,16:GOTO1030 :rem 65 320 FORI=YPTOFSTEP-8:POKEO,32
(3 SPACES)* * *" JL 7996 POKE 656, 2: POKE 657,		J=1 TO 5: NEXT J: NEX	:rem 126 330 POKEV,XP:POKEV+1,I:POKEH1,
2:? "LEVEL: (17 SPACES)SCORE:"		T I REM MUSIC DATA	(1/3):POKEL1,I :rem 228 340 IFB3=0THEN360 :rem 208
CJ 7997 GOSUB 1800	MK 19100	DATA 162,0,121,0,0, 96,0,121,0,0,162,0,	350 GOSUB 750 :rem 180
MC 7999 RETURN JB 10000 REM LEVEL 2 ROJUSTM		121,0,0,76,0,121,0,0,162,0,121,0,0,108	36Ø O=O-4Ø:NEXTI:Z=Ø:POKET1,16 :rem 73
J0 10010 XB1SPEED=3		,96,0,108,0,121,0,1	370 REM MUSI : rem 188 380 V3=VE : rem 252
KD 10019 REM ** DRAW A BIG R	DF 1911Ø	28, Ø, Ø, 121 DATA 1Ø8, Ø, Ø, 162, Ø,	390 REM BUG1 MOVEMENT :rem 250
CCK KF 10020 COLOR 3		128,0,0,108,0,128,0	400 IFB1<>0THEN460 :rem 9 410 POKEV+21, PEEK(V+21)OR2
JD 10030 PLOT 11,37:DRAWTO 2 5,37:PLOT 12,36:DRA		B,Ø,12B,Ø,Ø,162,Ø,B 1,72,B1,91,96,1ØB,1	:rem 1 420 X=INT(F1*RND(0)-F2):rem 18
WTO 25,36:PLOT 13,3 5:DRAWTO 20,35:PLOT		21,0,0 DATA 108,121,0	430 IFABS(X)<>1THEN520 :rem 22 440 B1=(-1)*(MI*(X=1)+MA*(X=-1
22,35:DRAWTO 24,35	JP 19200	GRAPHICS 2+16: SETCO))
00 10040 PLOT 14,34:DRAWTO 1 8,34		Ø,12,6:SETCOLOR 1,8	450 V1=X*S1 :rem 99
60 10050 F1=31:F2=15 00 10099 RETURN	CM 1921Ø	,4:SETCOLOR 2,0,8 POSITION 4,4:? #6;"	460 Bl=Bl+V1:POKET1,17:rem 241 470 IFBl <miorbl>MATHENB1=0:POK</miorbl>
OH 10100 REM **[EUE 3 ADJUS		Play Again [2" ? #6:? #6;"	ET1,16 :rem 223 48Ø Y1=INT((2Ø8)*B1+233.2)
NM 10104 REM ** DRAW GRASS PF 10117 N=20:HEIGHT=1:GOSUB		(7 SPACES) (M/C)"	:rem 165 49Ø POKEV+2,Bl:POKEV+3,Yl:POKE
12000	LN 1924Ø	POKE 764,255 I=PEEK(764):IF I<>3	V+40,2 :rem 157
EL 10119 REM ** DRAW A SMALL ROCK		5 AND I<>43 THEN 19 240	500 POKEH1, INT(RND(0)*3+19):PO KEL1, INT(RND(0)*1+9):POKET
KH 10120 COLOR 3:PLOT 60,37: DRAWTO 65,37:PLOT 6	NI 1925Ø	IF I=35 THEN GOTO 2	1,16 :rem 239 51Ø REM BUG2 MOVEMENT :rem 245
2,36:DRAWTO 64,36 KB 10130 XB2SPEED=2		POKE 764,255:GOTO 3	520 IFB2<>0THEN580 :rem 16
0E 1Ø199 RETURN	MJ 20000		530 POKEV+21, PEEK(V+21)OR4 :rem 6
50 COMPUTEI June 1985			Cwww commodore

550	IF ABS(X)<>1THEN640:rem 28
560	B2=(-1)*(MI*(X=1)+MA*(X=-1)) :rem 116
57Ø 58Ø	V2=X*S2 :rem 104
590	
600	
610	POKEV+4,B2:POKEV+5,Y2:POKE V+41,3 :rem 159
620	POKEH2, INT(RND(0)*3+25):PO
	KEL2, INT(RND(Ø)*1+9):POKET 2,16 :rem 242
63Ø 64Ø	IFB3<>ØTHEN71Ø : rem 15
65Ø 66Ø	IFABS(X) <> 1THEN 160:rem 27
67Ø	850 :rem 12
680	:GOTO11Ø :rem 150
69Ø	
700 710	
72Ø 73Ø	GOTO160 :rem 105
	:rem 73
74Ø 75Ø	POKET3,129 :rem 26
76Ø 77Ø	IFB3 <miorb3>MATHENB3=Ø</miorb3>
780	:rem 103 Y3=INT((208)*B3+233.2)
79Ø	
800	
810	
	KEV+40,0:POKEV+2,B1:POKET1,16 :rem 87
820	EV+40,0:POKEV+2,B1:rem 154
83Ø	:POKEV+4,B2:POKET2,16
	REM MUSIC :rem 1
85Ø 86Ø	RETURN :rem 125 BN=0:FORX=1TO3:BG=2 [†] X
870	:rem 64 IF(AANDBG)THENGOSUB900
	:rem 100 NEXT:IFBN=2THENSC=SC+50
885	:rem 207
	:rem 136 POKE214,20:PRINT:POKE211,3
	3:PRINTSC:RETURN :rem 194 IFBG=8THENGOSUB96Ø:RETURN
	:rem 142
910	IFPEEK(V+2*X)>=XP-24ANDPEE K(V+2*X)<=XP+24THENGOSUB95 Ø:SC=SC+25:POKEV+2*X,Ø
920	:rem 54 IFPEEK(V+2)=ØTHENB1=Ø
930	:rem 207
940	T2,16 :rem 85
950	BN=BN+1:POKEV+21,PEEK(V+21
960	
30300	K(V+2*X) <=XP+24THENLS=LS-1 :GOTO 980 :rem 219
97Ø 98Ø	REM SPIDER HITS BIG BUG
	:rem 52

	FORI=8TO2STEP-2:POKE53281,	1270	FORI=1988TO2016:POKEI+CL,
	I:POKE53280,I :rem 120 PRINT"{HOME}{WHT}		15:POKEI,160:NEXT:FORI=19 52T01976:POKEI+CL,15:
1000	[9 RIGHT]LIVES REMAINING		:rem 147
	{SPACE}";LS:NEXT :rem 31	1280	POKEI, 160: NEXT: FORI=1916T
1010	FORI=1TO700:NEXT:FORI=102	1	O1936:POKEI+CL,15:POKEI,1
	4T01Ø55:POKEI+CL,5:POKEI, 160:NEXT :rem 170		60:NEXT:FORI=1880T01896:
1020	POKE53280,0:POKE53281,0:R	1290	POKEI+CL, 15: POKEI, 160: NEX
	ETURN :rem 50		T:FORI=1844T01856:POKEI+C
1030	REM SPIDER LOST ALL LIVES		L,15:POKEI,160:NEXT
1040	:rem 13 O=0:XX=0:Z=0:FORI=0TO3:PO	1300	:rem 89 FORI=18Ø8TO1816:POKEI+CL,
10.0	KEV+21, PEEK(V+21) AND(15-2	1300	15:POKEI,160:NEXT :rem 97
	1):POKEV+2*I,Ø:NEXT	1310	FORI=1056TO1063:POKEI+CL,
	:rem 77		12:POKEI,102:POKEI+960+CL
1050	PRINT" [CLR] [6 DOWN] "SPC(1 5) "GAME OVER" : rem 199		,12:POKEI+960,102:NEXT :rem 80
1060	B=13-LEN(STR\$(SC))/2:PRIN	1320	FORI=1056T02016STEP40:POK
	T"{2 DOWN}"SPC(B)"YOUR SC		EI+CL,12:POKEI,102:POKEI+
1070	ORE IS "; SC :rem 142		7+CL,12:POKEI+7,102:NEXT
1070	PRINT" [2 DOWN] "SPC(12)" [RVS] TRIGGER[OFF] TO STAR	1330	:rem 32 RESTORE:FORI=1100T01260ST
	T" :rem 130	1000	EP40:READA:POKEI+CL,1:POK
1080	PRINT" {2 DOWN} "SPC(15)"	Saira	EI,A:NEXT :rem 88
	[RVS]N[OFF] TO STOP"	1340	FORI=1660T01820STEP40:REA DA:POKEI+CL,1:POKEI,A:NEX
1000	:rem 120 FR=PEEK(56320)AND16:GETA\$		T :rem 8
1000	:IFA\$=""ANDFR<>ØTHEN1Ø9Ø	1350	DATA12,5,22,5,12,19,3,15,
	:rem 139	1000	18,5 :rem 164 RETURN :rem 170
1100	IFFR=ØTHEN1ØØ : rem 22	1360	POKEV+21,9:POKE53275,14
1120	IFA\$="N"THENEND :rem 140 GOTO 1090 :rem 199	13/5	:rem 67
1130	PRINT" {CLR}": XP=100:CL=54	1380	FORI=ØTO3:POKEI+2Ø4Ø,192+
	272:V=53248:SC=Ø:LV=Ø:LS=	1000	I:NEXT :rem 151 RETURN :rem 173
	3:B1=Ø:B2=Ø:B3=Ø:F=56 :rem 254		RETURN : rem 173 REM LEVEL 2 ADJUSTMENTS
1140	V1=Ø:V2=Ø:V3=Ø:S1=4:S2=4:	1400	:rem 165
	S3=12:MI=0:MA=255:F1=51:F		S1=5:F1=31:F2=15 :rem 99
	2=25:RETURN : rem 122	1420	FORI=1904TO1907:POKEI+CL,
1156	SD=CL:FORL=SDTOSD+24:POKE L,0:NEXT:T1=SD+4:D1=SD+5:		INT(RND(Ø)*15+1):POKEI,16 Ø:NEXT :rem 137
	R1=SD+6:H1=SD+1:L1=SD	1430	FORI=1944TO1947:POKEI+CL,
	:rem 245		INT(RND(Ø)*15+1):POKEI,16
1160	T2=T1+7:T3=T2+7:D2=D1+7:D	1440	Ø:NEXT :rem 146 FORI=1984T01987:POKEI+CL,
	3=D2+7:R2=R1+7:R3=R2+7:H2 =H1+7:H3=H2+7:L2=L1+7	1440	INT(RND(Ø)*15+1):POKEI,16
	:rem 18		Ø:NEXT:RETURN :rem 181
1170	L3=L2+7:POKE54296,15:POKE	1450	S1=6:F1=31:F2=15:RETURN :rem 130
	D1,17:POKER1,241:POKED2,1 7:POKER2,241:POKED3,17	1460	S2=6:RETURN :rem 221
	:rem 34		S1=8:S3=16:F1=21:F2=10:RE
1180	POKER3,241:RETURN :rem 91		TURN :rem 228
1190	POKE53281,Ø:POKE5328Ø,Ø:F	1480	S1=10:S2=10:S3=20:F1=17:F 2=8:RETURN :rem 66
	ORI=1024T01056:POKEI+CL,5 :POKEI,160:NEXT :rem 184	1490	FORI = Ø TO3 : POKEV+21, PEEK(V
1200	FORI=1984T01743STEP-36:PO		+21)AND(15-211):POKEV+2*I
	KEI+CL,1:POKEI,233:NEXT	1500	,Ø:NEXT :rem 8
1210	:rem 2	1500	PRINT"{CLR}{6 DOWN} {9 RIGHT}YOU WON THE GAME
1210	FORI=1985TO1733STEP-36:PO KEI+CL,2:POKEI,160:NEXT		" :rem 129
	:rem 3	1510	PRINT" {2 DOWN} {9 RIGHT}YO
1220	FORI=1986T01744STEP-36:PO	1500	UR SCORE IS "; SC : rem 247 PRINT" {2 DOWN } {9 RIGHT }
	KEI+CL,3:POKEI,160:NEXT.	1520	{RVS}TRIGGER{OFF} TO STAR
1230	FORI=1987T017Ø5STEP-36:PO		T" :rem 169
	KEI+CL,4:POKEI,160:NEXT	1530	PRINT" (2 DOWN) [9 RIGHT]
1040	:rem 8		[RVS]N[OFF] TO STOP" :rem 156
1240	POKE1692+CL,7:POKE1692,20 1:FORI=1693T01696:POKEI+C	1540	FR=PEEK(56320)AND16:GETA\$
	L,7:POKEI,160:NEXT	3-2-950	:IFA\$=""ANDFR<>ØTHEN1540
	:rem 143	1550	:rem 139 :rem 31
1250	POKE1732+CL,7:POKE1732,22 1:FORI=1733TO1736:POKEI+C		IFFR=ØTHEN1ØØ : rem 31 IFA\$="N"THENEND : rem 149
	L,7:POKEI,160:NEXT	1570	GOTO 1540 : rem 208
	:rem 126	1580	I=12288 :rem 89

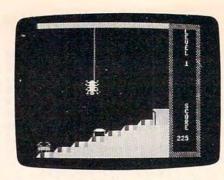
126Ø POKE1772+CL,7:POKE1772,22

L,7:POKEI,160:NEXT

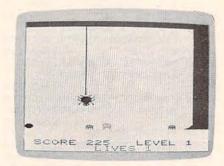
1:FORI=1773TO1776:POKEI+C

:rem 143

1610	DATA	224,126,7,96,255,6
1620	DATA	:rem 103 39,255,228,31,255,24
1630	8 DATA	:rem 1 1,255,128,193,255,13
	1	:rem 246
1640	DATA 52	:rem 57
1650	DATA	1,255,128,7,255,224 :rem 149
1660		31,255,252,33,255,13
1670	DATA	:rem 242 97,255,134,225,255,1
1680	34 DATA	:rem 53 15,255,243,31,255,24
	8	:rem 254
169Ø	DATA	16,60,4,24,126,4 :rem 250
1700	DATA	24,219,6,120,219,7 :rem 92
1710	DATA	Ø,126,Ø,Ø,Ø,Ø:rem 72
1720	DATA	Ø,Ø,Ø,Ø,3,255:rem 79
1730	DATA	192,31,255,248,127,2
1740	55	:rem 49
1740	DATA	254,151,255,233,32,0 :rem 189
1750	משמת	4,64,0,2,128,0
1750	DATA	:rem 142
1760	DATA	1,192,0,3,192,0 :rem 192
1770	DATA	3,192,0,3,192,0
1780	DATA	
1790	DATA	:rem 196 3,128,0,1,64,0
1000		:rem 144
1800	DATA	2,32,0,4,16,0:rem 81 8,24,0,24,252,0
1010	DATA	:rem 189
1820	DATA	63,0,0,0,0,0 : rem 26
1830	DATA	0,0,3,255,192,31
		:rem 241
1840	DATA	255,248,127,255,254,
1850	151 DATA	:rem 101 255,233,32,0,4,64
1000		:rem 43
1860	DATA	:rem 191
187Ø	DATA	Ø,3,192,Ø,3,192 :rem 196
1880	DATA	Ø,3,192,Ø,3,192 :rem 197
1890	DATA	0,3,192,0,3,128
1900	DATA	:rem 197 Ø,1,64,Ø,2,32:rem 82
1910	DATA	Ø,4,16,Ø,8,24:rem 9Ø
1920	DATA	0,24,252,0,63,0
		:rem 186
		15,0,240,24,129,24 :rem 87
		48,0,12,240,0,15 :rem 239
1950	DATA	152,129,25,207,0,243 :rem 194
1960	DATA	96,0,6,31,255,248
1970		:rem 57 63,255,254,127,255,2
1980		:rem 56 255,255,255,127,255,
	254	:rem 109 49,129,140,99,0,198
		:rem 171 66,0,66,132,0,33
		:rem 236
		132,Ø,33,132,Ø,33 :rem 17
2020		66,0,66,99,0,198 :rem 6
2030	DATA	247,129,239,Ø,Ø,256 :rem 143
		•16m 143



Commodore 64 "Webster Dines Out" takes advantage of sprite graphics.



"Webster Dines Out" for the VIC-20, a fast machine language game.

Program 3: Webster Dines Out For VIC-20

Translation by Kevin Mykytyn, Editorial Programmer
Please refer to "COMPUTEI's Guide to Typing In

Please refer to "COMPUTEI's Guide to Typing In Programs" before entering this listing.

Ø PRINTCHR\$(147)"VIC-2Ø WEBSTE
R MAKER":PRINT :rem 179
1 IFPEEK(43)+256*PEEK(44)=6609
THEN3 :rem 225
2 PRINT"POKE6608,0:POKE43,209:
POKE44,25:NEW":PRINT"{DOWN}E
NTER POKES, LOAD AGAIN":END

:rem 90
3 INPUT"[RVS]D[OFF]ISK OR
[RVS]T[OFF]APE";D\$:IFD\$="D"T
HEND=8:GOTO6 :rem 111
4 IFD\$<>"T"THEN3 :rem 159

5 D=1:REM FOR 64 CHANGE 57809 {SPACE}TO 57812 AND 63109 TO 62957 :rem 57 6 X=0:PRINT:PRINT"READING DATA

7 READA:IFA=256THEN9 :rem 107

8 POKE4609+X, A:X=X+1:GOTO7

:rem 87
9 PRINT"{DOWN}SAVING WEBSTER":
IFD=8THENSYS57809"@0:WEBSTER
",8,0 :rem 134
10 IFD=1THENSYS57809"WEBSTER",

1,0 :rem 246 11 POKE193,1:POKE194,18:POKE17 4,65:POKE175,23:SYS63109:PR INT"{DOWN}OK":END :rem 93

12 DATA 11,8,10,0,158,52,49,48,57,0,0 :rem 10
13 DATA 0,169,147,32,210,255,1

62,8,160,2,24 :rem 54 14 DATA 32,240,255,169,189,133 ,170,169,153,160,20:rem 113

15 DATA 32,30,203,120,173,4,14 4,9,8,141,15 :rem 253 16 DATA 144,166,170,202,208,25 3,32,159,255,32,228:rem 112 17 DATA 255,201,13,208,233,88, 32,197,20,169,10 DATA 141,174,2,169,25,141,1 76,2,169,0,133 :rem 115 DATA 2,133,252,133,253,165, 162,133,254,169,1 20 DATA 133,3,169,23,133,5,169 ,30,133,6,160 :rem 54 DATA 2,169,5,153,100,3,169, 10,153,110,3 :rem 248 DATA 136,16,243,169,2,141,1 03,3,141,104,3 23 DATA 169,4,141,113,3,141,11 4,3,162,4,32 24 DATA 17,19,202,16,250,169,1 5,141,14,144,32 :rem 155 DATA 81,19,32,188,16,32,173 ,16,32,56,17 :rem 24 DATA 174,176,2,32,160,18,32 ,173,18,32,136 :rem 115 DATA 18,32,251,19,76,149,16 ,165,2,208,84 :rem 81 DATA 165,197,201,64,240,78, 72,32,6,17,104 :rem 124 DATA 201,29,208,24,166,3,22 4,1,240,18,198 :rem 117 30 DATA 3,165,5,56,233,1,133,5 ,165,6,233 :rem 163 31 DATA Ø,133,6,76,0,17,201,37 208,24,166 DATA 3,224,17,240,18,230,3, 165,5,24,105 :rem 254 DATA 1,133,5,165,6,105,0,13 3,6,76,0 :rem 55 34 DATA 17,201,32,208,8,169,1, 133,2,169,16 :rem 12 35 DATA 133,251,169,0,32,20,17 ,96,162,3,189 :rem 69 DATA 174, 17, 168, 169, 32, 145, 5,202,16,245,96 :rem 183 37 DATA 141,175,2,165,5,24,105 ,0,133,247,165 :rem 110 DATA 6,105,120,133,248,162, 3,189,174,17,168 :rem 226 DATA 189,178,17,145,5,173,1 75,2,145,247,202 :rem 236 40 DATA 16,239,96,165,2,240,94 ,32,155,17,176 :rem 129 41 DATA 3,32,6,17,165,251,16,5 ,73,255,24 :rem 169 DATA 105,1,24,105,220,141,1 2,144,198,251,48 :rem 199 43 DATA 22,160,0,169,39,145,5, 165,5,24,105 :rem 12 44 DATA 22,133,5,165,6,105,0,1 33,6,76,144 :rem 213 DATA 17,165,251,201,255,208,3,32,182,17,201 :rem 206 DATA 239,208,9,169,0,133,2, 141,12,144,240 :rem 110 47 DATA 13,165,5,56,233,22,133 ,5,165,6,233 48 DATA Ø,133,6,32,155,17,176, 5,169,0,32 :rem 171 49 DATA 20,17,96,162,4,202,48, 12,189,174,17 :rem 78 50 DATA 168,177,5,201,40,144,2 43,56,96,24,96 :rem 130 51 DATA 22,23,1,0,36,35,34,33, 169,0,141 :rem 102 52 DATA 178,2,162,4,165,3,221, 90,3,240,40 :rem 210

:rem 43

:rem 60

53 DATA 24,105,1,221,90,3,240,

54 DATA 173,178,2,201,3,144,4,

32,202,16,238

169,100,208,6

55 DATA 201,2,144,13,169,50,24 ,101,252,133,252 :rem 196 DATA 165,253,105,0,133,253, 96,142,177,2,224 :rem 217 DATA 3,144,56,169,127,141,1 70,2,141,12,144 :rem 161 DATA 32,131,17,198,251,173, 170,2,24,105,127 :rem 214 DATA 141,13,144,173,170,2,3 2,20,17,165,162 :rem 156 DATA 197,162,240,252,206,17 0,2,16,230,32,6 :rem 154 DATA 17,206,242,31,173,242, 31,201,48,208,3 :rem 152 62 DATA 76,101,20,96,238,178,2 ,32,17,19,169 :rem 80 DATA 231,133,4,165,4,141,12 :rem 198 ,144,230,252,208 DATA 2,230,253,32,251,19,23 0,4,208,238,174 :rem 160 DATA 177,2,206,174,2,240,3, 76,204,17,169 :rem 72 66 DATA 10,141,174,2,173,225,3 1,201,54,240,41 :rem 146 DATA 32,71,19,74,74,74,74,1 68,185,141,31 :rem 89 DATA 201,32,208,241,185,142 31,201,32,208,234 :rem 45 69 DATA 169,40,153,141,31,153, 142,31,169,0,153 :rem 213 DATA 141,151,153,142,151,23 8,225,31,96,162,2 :rem 1 DATA 189,90,3,205,93,3,208, 10,32,71,19 :rem 224 DATA 201,15,176,3,32,17,19, 202,16,235,96 :rem 64 DATA 152,72,160,0,136,208,2 73 53,202,208,248,104 :rem 51 DATA 168,96,162,4,189,90,3, 168,222,60,3 :rem 36 DATA 208,66,189,70,3,157,60 3,185,140,31 :rem 77 76 DATA 201,40,176,5,169,32,15 3,140,31,189,80 :rem 170 DATA 3,208,23,192,22,208,12 ,165,162,201,5 :rem 108 DATA 176,3,32,17,19,76,13,1 :rem 187 9,254,90,3 DATA 200,76,250,18,192,0,20 8,12,165,162,201 :rem 210 DATA 5,176,3,32,17,19,76,13 19,222,90 :rem 177 DATA 3,136,185,140,31,201,4 0,176,12,189,61 :rem 160 DATA 19,153,140,31,189,66,1 :rem 9 9,153,140,151,202 DATA 16,159,96,173,36,145,1 6,9,169,0,157 :rem 93 DATA 80,3,169,1,208,7,169,1 ,157,80,3 :rem 132 DATA 169,21,157,90,3,32,71, 19,221,100,3 :rem 11 DATA 144,248,221,110,3,176, 243,157,60,3,157 :rem 219 DATA 70,3,96,37,37,37,38,38 ,4,4,4 :rem 250 DATA 6,6,165,254,10,10,56,1 01,254,133,254 :rem 113 DATA 96,169,30,141,15,144,1 69,147,32,210,255 :rem 26 DATA 169, 28, 32, 210, 255, 169, 0,133,247,169,21 :rem 224 DATA 133,248,166,247,164,24 8,24,32,240,255,169:rem 129 DATA 42,32,210,255,198,248, 16,239,169,20,133 :rem 21 DATA 248,169,19,133,247,166 93 ,247,164,248,24,32 :rem 88 DATA 240,255,169,42,32,210, 255,198,247,16,239 DATA 230,248,165,248,201,22

,208,227,160,43,169:rem 119 96 DATA 5,153,162,151,169,42,1 92,22,176,2,169 :rem 181 97 DATA 41,153,162,31,136,16,2 :rem 165 37,169,40,160,0 98 DATA 153,140,31,169,0,153,1 40,151,162,21,160 :rem 253 99 DATA 1,24,32,240,255,169,21 3,160,19,32,30 :rem 113 100 DATA 203,169,43,141,159,31 ,169,2,141,159,151 :rem 54 101 DATA 96,28,83,67,79,82,69, 32,48,32,32 :rem 249 102 DATA 32,32,32,76,69,86,69, :rem 240 76,32,49,13 103 DATA 32,32,32,32,32,32,32, 32,31,76,73 :rem 201 104 DATA 86,69,83,32,51,0,165, :rem 70 252,141,168,2 105 DATA 165,253,141,169,2,169 ,Ø,141,17Ø,2,141 :rem 2Ø4 106 DATA 171,2,141,172,2,141,1 73,2,162,15,14 :rem 93 107 DATA 168,2,46,169,2,120,24 :rem 167 8,173,170,2,109 108 DATA 170,2,141,170,2,173,1 71,2,109,171,2 :rem 96 DATA 141,171,2,173,172,2,1 09,172,2,141,172 :rem 202 110 DATA 2,216,88,202,16,216,1 60,0,162,2,189 :rem 103 DATA 170,2,72,74,74,74,74, :rem 103 32,86,20,104 :rem 14 112 DATA 41,15,32,86,20,202,16 ,236,96,205,173 :rem 157 113 DATA 2,240,9,9,48,141,173, 2,153,213,31 114 DATA 200,96,104,104,162,11 ,160,3,24,32,240 :rem 185 115 DATA 255,169,137,160,20,32 ,30,203,32,228,255 :rem 51 116 DATA 201,89,208,3,76,62,16 ,201,78,208,242 :rem 171 117 DATA 169,0,133,198,0,31,80 ,76,65,89,32 :rem 30 118 DATA 65,71,65,73,78,32,89, :rem 252 47,78,0,144 119 DATA 87,69,66,83,84,69,82, 32,68,73,78 :rem 19 120 DATA 69,83,32,79,85,84,13, :rem 225 13,13,13,31 121 DATA 32,32,72,73,84,32,82, :rem 240 69,84,85,82 122 DATA 78,32,84,79,32,80,76, 65,89,0,160 :rem 244 123 DATA Ø, 185, Ø, 128, 153, Ø, 28, 185,0,129,153 :rem 55 124 DATA Ø, 29, 136, 208, 241, 169, 255,141,5,144,160 :rem 6 125 DATA 95,185,231,20,153,8,2 9,136,16,247,96 :rem 183 DATA 32,24,135,79,63,159,1 59,95,8,48,193 :rem 149

127 DATA 242,252,249,249,250,2

52,240,232,196,226,162

128 DATA 192,0,63,15,23,35,71,

129 DATA Ø,124,214,254,254,170

130 DATA 219, 255, 36, 195, 1, 1, 1,

.32 DATA 255,255,255,255,255,2

55,255,255,255,255,255

133 DATA 255, 255, 255, Ø, Ø, 1, 3, 7

DATA 1,0,60,126,255,255,25

,170,126,129,153,231

5,126,60,170,187

,15,63,255,256

69,3,0,0

1,1,1,1

:rem 11

:rem 63

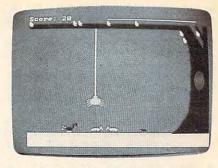
:rem 150

:rem 253

:rem 210

:rem 28

:rem 108



Multicolored bugs scurry across the lawn in "Webster Dines Out" for the IBM PC/PCjr.

Program 4: Webster Dines Out For IBM PC/PCjr

Translation by Charles Brannon, Program Editor

Please refer to "COMPUTEI's Guide to Typing In Programs" before entering this listing.

PC with Color/Graphics Adap tor and BASICA or Expanded PCjr

16 2 PLAY "mb

EE 100 DEFINT A-Z:KEY DFF:WIDTH 40:SCREEN 0,1,0:COLOR 7,0 ,0:CLS:RANDOMIZE TIMER

NO 110 FOR I=1 TO 11:COLOR, I:LO
CATE I,1,0:PRINT SPACE\$(3
9):COLOR, 15-I:LOCATE 24I,1:PRINT SPACE\$(39):NEXT

FD 120 LOCATE 12,1:COLOR 0,15:PR
INT SPACE\$(12)+"Webster D
ines Out"+SPACE\$(10)

00 125 LOCATE 16,1:PRINT"
Do you want sound? (Y/N)"
;:A\$=INPUT\$(1):IF A\$="y"
OR A\$="Y" THEN SOUNDFLAG=

NJ 130 IF SOUNDFLAG THEN PLAY "1 16o2cccd cfffg faaa ba>18d 116 ggged ccc <ag fffdc 14<f

KF 135 GOSUB 55Ø

6A 15Ø SCREEN 1:CLS:COLOR 1,0:LI NE (0,180)-(319,199),1,BF

NK 160 LINE (250,180)-(319,180), 2:LINE (250,180)-(260,175),2:LINE -(280,150),2:LINE -(285,130),2:LINE -(285,80),2:LINE -(283,50),2:LINE -(270,20),2:LINE -(0,20),2::LINE (310,50)-(285,13),2:LINE (310,50)-(310,13),2:LINE (0,13)-(285,13),2:LINE (0,13)-(

9N 161 LINE (310,38)-(295,13),2: LINE (310,28)-(300,13),2: LINE (310,37)-(310,30),0: LINE (295,13)-(300,13),2: LINE (310,13)-(319,13),2: PAINT (0,14),2,2:PSET (30 3.28),1

DI 162 A\$="c113ululuuuuurdrdrdrd rd11ulu":DRAW A\$:PSET (27 2,29),1:DRAW A\$:PSET (278 ,40),1:DRAW A\$:FOR I=1 TO 5:PSET (250*RND(1),15):D RAW A\$:NEXT

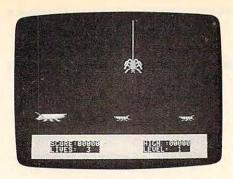
- AA 165 FOR I=Ø TO 15 STEP 2:CIRC LE (300,100),I,0,,,8/5:NE
- DB 170 BEETSPEED=2:BEET2SPEED=2:BUGSPEED=2:BUG2SPEED=2:SC
- LC 180 BEETSCORE=10:BUGSCORE=20:
 MISSLIFE=10:BUGLIFE=10:BE
 ETLIFE=15:DRAINLIFE!=.5:P
 ROBABILITY=20
- KC 19Ø WEBX=1ØØ:WEBY=21:PUT (WEB
 X,WEBY),WEB,PSET:LIFE!=18
 Ø:GOSUB 1Ø3Ø:LOCATE 1,1:P
 RINT"Score:";Ø
- OK 200 LIFE!=LIFE!-DRAINLIFE!:SO UND 40,.1*SOUNDFLAG:GOSUB 1030
- NP 210 IF SCORPFLAG THEN PUT (SC ORPX,SCORPY),SCORP,PSET:S CORPX=SCORPX-SCORPSPEED:I F SCORPX<0 THEN SCORPFLAG =0:PUT (SCORPX+SCORPSPEED ,SCORPY),SCORP
- ME 220 IF BEETFLAG THEN PUT (BEE TX, BEETY), BEET, PSET: BEETX =BEETX+BEETSPEED: IF BEETX >231 THEN BEETFLAG=0:PUT (BEETX-BEETSPEED, BEETY), B EET
- KF 23Ø IF BEET2FLAG THEN PUT (BE
 ET2X, BEET2Y), BEET2, PSET: B
 EET2X=BEET2X-BEET2SPEED: I
 F BEET2X<Ø THEN BEET2FLAG
 =Ø:PUT (BEET2X+BEET2SPEED
 , BEET2Y), BEET2</pre>
- CH 240 IF BUGFLAG THEN PUT (BUGX ,BUGY),BUG,PSET:BUGX=BUGX -BUGSPEED:IF BUGX<Ø THEN BUGFLAG=0:PUT (BUGX+BUGSP EED.BUGY),BUG
- BN 250 IF BUG2FLAG THEN PUT (BUG 2X, BUG2Y), BUG2, PSET: BUG2X = BUG2X+BUG2SPEED: IF BUG2X > 226 THEN BUG2FLAG=0: PUT (BUG2X-BUG2SPEED, BUG2Y), BUG2
- AG 26Ø K\$=INKEY\$:IF K\$="" THEN 4 2Ø
- F6 270 IF K\$=CHR\$(0)+CHR\$(75) TH EN PUT (WEBX,WEBY),WEB:WE BX=WEBX+10*(WEBX>0):PUT (WEBX,WEBY),WEB:GOTO 200
- FE 280 IF K\$=CHR\$(0)+CHR\$(77) TH EN PUT (WEBX,WEBY),WEB:WE BX=WEBX-10*(WEBX<220):PUT (WEBX,WEBY),WEB:GOTO 200
- ED 290 IF K\$<>" " THEN 420 PL 300 FOR I=WEBY TO 145 STEP 3: PUT (WEBX,I),WEB,PSET
- LJ 310 SOUND 500+I*20,.1*SOUNDFL AG
- KF 32Ø NEXT:WBX=WEBX+15:NUMHIT=Ø
 DH 33Ø IF BEETFLAG THEN IF ABS(W
 BX-(1Ø+BEETX-BEETSPEED))
 1Ø THEN PUT (BEETX-BEETSP
 EED,BEETY),BEET:BEETFLAG=
 Ø:LIFE!=LIFE!+BEETLIFE:SC
 ORE!=SCORE!+BEETSCORE:GOS
 UB 97Ø:NUMHIT=NUMHIT+1
- EK 340 IF BEET2FLAG THEN IF ABS(
 WBX-(10+BEET2X+BEET2SPEED
))<10 THEN PUT (BEET2X+BE
 ET2SPEED, BEET2Y), BEET2:BE
 ET2FLAG=0:LIFE!=LIFE!+BEE
 TLIFE:SCORE!=SCORE!+BEETS
 CORE:GOSUB 970:NUMHIT=NUM
 HIT+1
- 61 350 IF BUGFLAG THEN IF ABS(WB X-(12+BUGX+BUGSPEED))<10 THEN PUT (BUGX+BUGSPEED, B UGY), BUG:BUGFLAG=0:LIFE!= LIFE!+BUGLIFE:SCORE!=SCOR

- E!+BUGSCORE:GOSUB 970:NUM HIT=NUMHIT+1
- NJ 360 IF BUG2FLAG THEN IF ABS(W BX-(12+BUG2X-BUG2SPEED)) < 10 THEN PUT (BUG2X-BUG2SP EED, BUG2Y), BUG2: BUG2FLAG= 0:LIFE!=LIFE!+BUGLIFE: SCO RE!=SCORE!+BUGSCORE: GOSUB 970:NUMHIT=NUMHIT+1
- NN 370 IF SCORPFLAG THEN IF ABS(
 WBX-(16+SCORPX+SCORPSPEED
))<10 THEN WEBY=145:GOTO
 1070
- FD 380 IF NUMHIT=0 THEN LIFE!=LI FE!-MISSLIFE:IF LIFE!<1 T HEN WEBY=145
- FL 39Ø GOSUB 1Ø3Ø:IF NUMHIT>1 TH
 EN SCORE!=SCORE!+1Ø^NUMHI
 T:GOSUB 98Ø:FOR W=1 TO 5Ø
 :SOUND 3ØØØ+1Ø*(W AND 1),
 .Ø5*SOUNDFLAG:NEXT:LINE (
 Ø,17Ø)-(249,179),Ø,BF
- M6 400 FOR I=140 TO WEBY STEP-3: PUT (WEBX,I), WEB, PSET: SOU ND I*20+500,.1*SOUNDFLAG: NEXT: PUT (WEBX, WEBY), WEB, PSET
- CG 4Ø5 IF INKEY\$<>"" THEN 4Ø5
- BL 410 GOTO 200
- 10 420 IF 100*RND(1)>PROBABILITY
 THEN 200
- BK 43Ø ON 5*RND(1)+1 GOSUB 44Ø,4 6Ø,48Ø,5ØØ,52Ø:GOTO 2ØØ
- FC 44Ø IF BEETFLAG=Ø THEN BEETFL AG=1:BEETX=Ø
- NI 450 RETURN
- KA 460 IF BEET2FLAG=0 THEN BEET2 FLAG=1:BEET2X=231
- NN 47Ø RETURN
- FD 48Ø IF BUGFLAG=Ø THEN BUGFLAG =1:BUGX=226
- NA 49Ø RETURN
- CF 500 IF BUG2FLAG=0 THEN BUG2FL AG=1:BUG2X=0
- MB 51Ø RETURN
- JL 52Ø IF SCORPFLAG=Ø THEN SCORP FLAG=1:SCORPX=218
- MF 53Ø RETURN
- LG 54Ø END
- LJ 55Ø BOTSCR=18Ø
- PK 56Ø READ X,Y:E=(4+INT((X+7)/8)*Y)/2:DIM WEB(E):WEB(Ø)= X:WEB(1)=Y:WEBY=BOTSCR-Y: FOR I=2 TO E:READ WEB(I): NEXT
- OH 570 READ X,Y:E=(4+INT((X+7)/8)*Y)/2:DIM BEET(E):BEET(0)=X:BEET(1)=Y:BEETY=BOTSC R-Y:FOR I=2 TO E:READ BEE T(1):NEXT
- FK 58Ø READ X,Y:E=(4+INT((X+7)/8)*Y)/2:DIM BEET2(E):BEET2 (Ø)=X:BEET2(1)=Y:BEET2Y=B OTSCR-Y:FOR I=2 TO E:READ BEET2(I):NEXT
- HC 59Ø READ X,Y:E=(4+INT((X+7)/8)*Y)/2:DIM BUG(E):BUG(Ø)=
 X:BUG(1)=Y:BUGY=BOTSCR-Y:
 FOR I=2 TO E:READ BUG(I):
 NEXT
- EA 600 READ X,Y:E=(4+INT((X+7)/8)*Y)/2:DIM BUG2(E):BUG2(0)=X:BUG2(1)=Y:BUG2Y=BOTSC R-Y:FOR I=2 TO E:READ BUG 2(I):NEXT
- CD 610 READ X,Y:E=(4+INT((X+7)/8)*Y)/2:DIM SCORP(E):SCORP (0)=X:SCORP(1)=Y:SCORPY=B OTSCR-Y:FOR I=2 TO E:READ SCORP(I):NEXT
- ME 62Ø RETURN LF 63Ø END

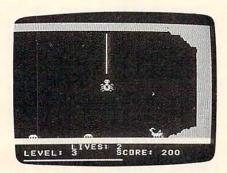
- J0 640 DATA &H3C, &H1a, &H0, &H500, &H5, &H0, &H0, &H0, &H500
- EI 650 DATA &HØ,&HØ,&HØ,&H500,&H Ø,&HØ,&HØ,&HFF00
- CG 660 DATA &HFØ, &HØ, &HØ, &HFFØF, &HØ, &HØ, &HBFØA
- HE 67Ø DATA &HEA, &HØ, &HØ, &HBFØA, &HEA, &HØ, &HØ, &HBFØ2
- LB 680 DATA &HEB, &HØ, &HØ, &H3F00, &HCØ, &HØ, &HØ, &HFF0F
- GL 69Ø DATA &HCØFF, &HØ, &HØ, &HFFF F, &HFCFF, &HØ, &H57Ø1, &HF5D
- HC 700 DATA %H7DFF, %H54, %HF14, &H D5F5, %HFF75, %H4001, %HF40, %H75FF
- JP 710 DATA &HFFDF, &H1000, &H5F01, &H55F7, &HFF5D, &H54, &H314
- NO 720 DATA &H5CFF,&H4001,&H1540 ,&HD5FF,&HF57F,&H1040,&H4 001,&HD5FF
- EL 73Ø DATA &HFØ7F, &H14, &H1Ø4, &H F543, &H14FC, &H1, &H141Ø, &H Ø
- BI 740 DATA &H100,&H4040,&H4000, &H0,&H0,&H10,&H1,&H0
- OL 75Ø DATÁ %HØ,%H4,%HØ,%HØ,%HØ, %HØ,%HØ,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø, ,Ø,Ø,Ø
- PP 76Ø DATA &H26,&H5,&HØ,&HABAA, &HAØ,&HAA2A,&H5BAA,&HAAØØ
- LI 770 DATA &HABAA, &HAØ, &H1101, & H10, &H0, &H0, &H0, &HFF00
- EL 78Ø DATA %H24,%H5,%HAA28,%HA8 ,%H96ØØ,%HAAAA,%H8Ø,%HAA2 8
- IJ 79Ø DATA &HAØAA, &HØ, &H411Ø, &H Ø, &HØ, &HØ, &HØ, &HØ
- № 800 DATA &H30,&HA,&H3,&H0,&H0 ,&H300C,&H0,&H0
- NI 810 DATA &HC005,&H0,&H0,&H439 5,&HFFFF,&HC0,&H5F5A,&HFF
- FI 820 DATA &HF4, &H55A, &H5555, &H 55, &H900, &H5A5A, &H54, &H20
- 10 83Ø DATA &H2Ø2Ø, &HØ, &H2ØØØ, &H 2Ø2Ø, &HØ, &HØ, &HØ, &HØ
- NC 84Ø DATA &HØ
- KB 850 DATA &H30,&HA,&H0,&H0,&HC 000,&H0,&H0,&H300C
- 0A 86Ø DATA %HØ,%HØ,%H5ØØ3,%H3ØØ ,%HFFFF,%H56C1,%H1FØØ,%HF
- LO 87Ø DATA &HASF5, &HS50Ø, &HS555, &HAS5Ø, &H150Ø, &HASAS, &H6
- K6 88Ø DATA &H8Ø8, &H8, &HØ, &H8Ø8, &H8, &HØ, &HØ, &HØ
- 0M 89Ø DATA &HØ
- LL 900 DATA &H40, &HD, &H0, &H0, &H2 A00, &H80, &H0, &H0
- ON 910 DATA &HA202, &HA0, &H0, &H0, &H0. &HB202, &HA0, &HB0C, &H0
- HD 920 DATA &H20A, &H80, &H2633, &H
 0, &HA, &HC0, &HE600, &HA882
- ₽ 93Ø DATA %H32A, %HØ, %HA63Ø, %HA AAA, %HAB, %HØ, %HAAC3, %HAAA
- KO 940 DATA &HAØ,&HØ,&HZA3C,&HAA 2A,&HBØ,&HØ,&HØ,&HAAØA
- PF 950 DATA &HBØ, &HØ, &HØ, &H1111, &HØ, &HØ, &HØ, &HØ, &H4444
- IN 970 LOCATE 1,1:PRINT"Yummy!":
 SOUND 110,2*SOUNDFLAG:FOR
 I=600 TO 500 STEP-2:SOUN
 D I,.1*SOUNDFLAG:NEXT I
- JE 980 LOCATE 1,1:PRINT"Score:";

JB 990 IF SCORE!>500 THEN BUGSPE 11F8: 12 AD 18 Ø8 FØ 17 2Ø 9F D6 1498: 4C 58 14 AØ C9 A9 1A A2 55 15 CE ØF ØB 20 A3 1200: 16 AD 18 ØB 18 6D 11 ØB BE 14AØ: 1E 2Ø 7C ED=3:BUG2SPEED=3:SCORPSPE C9 BØ Dø B2 ED=5: PROBABILITY=18: DRAIN 12Ø8: 8D 11 98 90 an 20 4F 13 B3 14A8: 38 16 AD OF OR LIFE!=.6:MISSLIFE=15 1210: 90 03 4C ØB 11 AD 19 ØB FØ 14BØ: 36 AØ ØD A9 03 20 78 19 FA FA 1000 IF SCORE!>1000 THEN BUGS 1218: FØ 93 20 9B 16 AD 99 CØ 5B 14RR: AG 90 49 14 A2 ØF 20 98 59 AD ØØ CO 10 8D PEED=4: BUG2SPEED=4: BEETS 1220: 10 3B 20 10 CØ C9 8D DØ RA 19 20 10 CØ 1400: 9B 30 CE FØ 94 PEED=3:BEET2SPEED=3:SCOR 1228: 93 20 15 20 2E ØB F4 14CR: FR 20 10 00 C9 77 **C9** 1230: 20 C9 88 DØ GA AD 27 09 59 14DØ: EE DØ Ø3 4C F1 16 49 F3 PSPEED=6: PROBABILITY=17: 1238: FØ 23 CE 27 09 10 1E C9 78 14D8: 20 AØ 99 99 DØ Ø7 99 DØ 79 DRAINI TEF != 1 1240: 95 DØ ØC AD 27 09 **C9** 23 **D3** ØB CØ 28 Dø F5 60 18 92 CB 14FØ: LL 1010 IF SCORE!>5000 THEN BEET 1248: FØ EF 27 99 10 ØE C9 68 ØB BD ØR 7F 13 RF 21 14FR. 40 42 90 SPEED=4: BEET2SPEED=4: DRA 1250. AG DO ØA 49 RØ RD 2F OR 73 14FØ: 99 FØ 3C BD ao 90 38 F9 OLA INLIFE!=2: PROBABILITY=15 10 1258: A9 98 BD 30 Ø8 40 A7 11 DS 14F8: 04 CD 27 09 31 18 69 FA :MISSLIFE=20 99 1260: A2 00 AØ 99 80 20 08 BD 9C 1500: 06 CD 27 30 29 A9 99 SE IB 1020 RETURN 1268: ØB 09 DØ 29 20 6F 15 29 91 15Ø8: 90 ØB 99 AD 21 ØB FØ ØE 18 JG 1030 IF LIFE!>180 THEN LIFE!= 15 ØR 69 RD ØB CD 1270: DØ 50 20 10 CØ ØB ØB 32 DE 6F AD 1510: 18 180 39 90 93 ØC ØB EE 21 1278: A9 01 99 32 ØR DO **B5** 49 DE 1518: ØR FF IB 1040 LINE (136.5) - (136+LIFE! 19 BD 60 1280: 14 Dø 09 A9 FF 99 32 Ø8 74 1520: an 18 AD ØR ØB 69 5),-2*(LIFE!(3Ø)-3*(LIFE 1288: AØ BA A9 1A 20 7C 15 FF BE 1528: ØB Ø8 9Ø Ø3 EE ØC Ø8 8A SE !>3Ø)+2*(LIFE!>=6Ø):LINE 1539: 18 69 95 AA **C9** 14 DØ **B**6 93 1290: Ø8 4C CF **B9** 32 Ø8 2D 18 12 (137+LIFE!,5)-(319,5),Ø 29 20 FØ OC. F9 08 AD 1F 1298: 20 1E ga. FØ 93 79 12 20 94 1538: 60 01 1050 IF LIFE!<1 THEN 1110 Ø9 3C RF R2 12AØ: 7D 09 09 9D 154Ø: AD 28 09 an aa IR AG 50 ØF 18 JN 1060 RETURN DØ ØA AD 28 09 RD 34 12AB: 99 **C9** FD 30 1D C9 28 10 F6 1548: A9 1A FOR J=1 TO 5 1070 19 99 99 FD 20 09 19 155Ø: ØA 1B AØ C4 A9 1A A2 19 BA 12RØ: 38 BD 1080 FOR I=145 TO 130 STEP-3: 69 AD 27 99 18 26 12B8: 9Ø 15 C9 OK BO 11 AD 2B 74 1558. 20 70 15 PUT (WEBX.I). WEB. PSET: NE 28 09 FØ 12CØ: 99 FØ ØC. 20 6F 15 29 03 4F 1560: 92 BD 22 99 AD D4 XT: SOUND 50, SOUNDFLAG AD 92 Ø1 8D 99 12C8: DØ Ø5 A9 99 9D Ø8 Ø9 BA 75 1568: Ø2 A9 21 60 IS 1090 FOR I=130 TO 145 STEP 3: 05 AA AC ØB C8 65 1579: 23 Ø8 ØA ØA 38 4D 23 Ø8 **D**5 12DØ: 18 69 20 PUT (WEBX, I), WEB, PSET: NE 15 BD 7F 98 A9 BC BA 12DB: CØ GA Dø 88 60 AD 2B 90 1A 1578: BD 23 XT:SOUND 60, SOUNDFLAG 88 18 69 3Ø 3D BB AØ 94 OLA 95 12EØ: DØ 2B 20 2E ØB 20 30 158Ø: 15 6M 1100 NEXT J 15 9D 12E8: 6F 29 DC DØ 36 A9 90 AF 1588: AA **B9** FF FF 98 09 CA AF 1110 FOR I=1 TO 10:PUT (WEBX+ GR GR 1590: 10 FB AC BA 15 AD D7 12FØ: 38 FD 31 RD 31 30 C4 88 F6 AØ 99 5*RND(1)+5*RND(1)*(WEBX> 12FB: Ø6 AØ AB A9 1A DØ 94 15 1598: 8B 15 60 20 10 CØ 20 78 1300: A9 A2 23 20 7C 15 FB 20 10 CO 60 20 D5 5), WEBY+5*RND(1)-5*RND(1 BØ 1A FD 15AØ: CØ 10)), WEB: SOUND 40, .1*SOUND 13Ø8: EE 19 Ø8 DØ 17 AD 20 09 CA 15A8: **C5** 15 AE ØB ØB EC ØD Ø8 97 31 ge. BD 20 99 C9 3D ØB ED ØF Ø8 90 ØC 52 1310: 18 6D 15BØ: AD ØC FI AG: NEXT 1318: F9 30 C9 49 OR AD OF F7 ND 1120 IF INKEY\$<>"" THEN 1120 014 28 30 05 10 1588: RF OD ØB AD OC. 15 JL 1130 LOCATE 13, 13: PRINT"Play 1320: ØØ BD 2B 99 60 AD 28 Ø9 B2 15CØ: an 20 DB 60 AC ØB Ø8 37 Again? (Y/N)"::A\$=INPUT\$ (1):IF A\$="y" OR A\$="Y" 20 1328: Dø ØB AD 30 ØB 10 03 38 30 1508: AD ØC 98 F2 15 AØ ØA 97 19 C9 90 Ø1 2Ø 78 4C 15 70 133Ø: BØ 1C 78 ØB AØ FB 55 15DØ: A9 E8 ØØ B1 OF OR 20 F2 1338: BC 30 08 A0 B0 20 AØ 15D8: AC ØD ØR AD 30 THEN RUN 2F 28 AØ A9 Ø1 20 78 19 CE HH 1140 SCREEN 0,0,0 1340: 80 ØB 18 AD 09 6D 88 15EØ: 15 1F 1348: 30 ØB BD 28 09 18 49 60 CF HC 115Ø END 15E8: 29 A9 Ø8 A2 Ø5 20 98 65 AØ 1350: DØ BD 11 08 AC 10 ØR CØ 5B 15FØ: 19 60 80 27 Ø8 8D 28 ØB 92 **Program 5: Webster Dines** 1358: B6 DØ 93 40 **B1** 14 CB BC 2F 9D 15F8: A2 94 A9 BØ 29 Ø8 CA 22 20 49 **Out For Apple** 1360: 10 Ø8 16 A9 28 BD 5E 1400: 10 FA FR AD 27 ØR DD 34 34 1368: ØB A9 47 8D 18 A9 17 17 68 1608: 16 AD 28 Ø8 FD 30 16 90 90 Translation by Tim Victor, Editorial 1370: 18 SD 18 18 49 14 85 FC 30 1610: 11 BD 28 98 AD 27 Ø8 FD **C5** Programmer 1378: A9 1B 85 FD 2Ø 6F 15 BD 41 29 9E 1418: 34 8D 27 ØR FF ØB 14 Please refer to the article "Apple MLX" else-1380: 16 Ø8 C9 AØ BØ F6 4A 44 37 1620: DØ F1 FR FØ 94 DØ DC AD 23 where in this issue before entering this listing. 1388: 29 FF 8D 07 Ø8 AD 16 ØB 50 1628: 27 Ø8 69 AF 9D 29 Ø8 60 14 1390: START ADDRESS: 1100 29 97 C9 07 F0 E6 18 69 73 1630: 27 Ø3 00 99 10 E8 64 ØA 1398: 02 8D 16 Ø8 29 Ø1 FØ 06 9B ØC 19 END ADDRESS: 1638: AØ A9 02 20 78 AØ C2 1F14 1100: 20 AC 19 A9 00 BD 0D 0B 73 13A0: FF 07 ØB AØ 04 AØ 20 Ø2 2F 1440. OF 49 Ø8 42 01 20 98 19 50 Ø8 8B 13A8: B1 FC 85 EE CB B1 FC 60 AØ 19 1108: 8D ØE Ø8 A9 20 8D 1E 85 13 1648: 21 A9 02 20 78 26 FE 1110: 85 E6 2Ø F2 F3 20 57 CØ A1 13BØ: EF CB B1 FC 85 CB B1 72 1650: AØ 10 A9 ØB A2 01 20 98 20 52 CØ 2C 50 CØ 20 10 AD 1388: FC 85 FF A9 Ø2 8D 12 Ø8 CE 1658: 19 60 A9 BØ A9 1118: 8D 6B 1A 5E FF 13CØ: A9 99 BD CØ A9 40 85 20 F2 F3 Ø8 A9 E₆ 13 78 BD 04 1660: BD ØA ØB 99 Ø8 A9 1120: 97 8D 7F 49 1128: 49 60 85 E6 20 F2 F3 R4 13C8: 14 Ø8 49 7F BD 15 ØB AC A5 1668: 39 BD 6D 14 A9 ØB BD 6F DA 1130: 5Ø 85 FC A9 06 85 FD A9 02 13DØ: 16 Ø8 FØ 24 ØE 12 Ø8 10 30 1679: 1A 60 AD 28 09 44 4A 4A 44 20 AØ 27 91 FC 88 10 FR B6 12 Ø8 AD AB 1678: 69 06 8D ØA 8D 09 GR 1138: 13DR: 08 AD 69 80 12 98 RD FD A5 FD **C9** 94 FD Ø8 Ø8 DØ 14 24 168Ø: A9 1140: E₆ 13EØ: 98 2F 13 98 38 2E 80 BD 6B 1A A9 38 8D 7F 1148: A9 ØA 85 FD C9 ØC DØ E7 56 Ø8 AD 14 Ø8 69 80 BD 84 1688: 6D 1A A9 Ø8 8D 13F8: 10 6E 1A 60 62 7F 90 20 53 49 1150: A5 FC 69 DB 13FØ: 14 98 2E 15 Ø8 88 DØ DC 1B 1690: AD 1E Ø8 29 20 FØ C3 A9 1158: CØ AØ Ø4 A9 Ø1 20 78 19 Be ØB 91 EE AD 2B 1698: ØA DØ DF A9 24 DØ DB A9 AØ ØB AD 13 5A 13F8: 70 A2 ØB 20 98 DF ØB FD AØ A9 1A 88 AD 12 1160: 1400: 15 ØB 91 FE 1640: 94 DØ D7 49 B3 BD ØF ØR 93 1148: 19 Da GA 49 92 20 78 19 F4 AD 14 ØB 91 FF 88 BB 16A8: 20 38 A9 B1 BD 10 ØB 30 1408: 91 EE 16 Ø8 Ø8 7B A9 A2 ØB 20 98 B2 E4 1179: AØ 1A 1410: 10 E8 A9 87 8D 20 16BØ: A9 DØ BD 11 ØB 20 49 16 12 1178: 19 AØ 19 A9 Ø1 20 78 19 9F AD 10 ØB C9 **B4** 90 80 16B8: A9 99 BD ØB BD ØC ØB B2 1418: DC 17 ØB 86 A9 ØB 20 98 85 1420: 85 DF 1180: AØ 1A A2 A9 1B 10 49 14 85 FC 1600: 20 C5 15 20 DB 15 AØ 99 AF 1428: FD A9 81 8D Ø8 Ø8 98 99 1188: 19 AØ 19 49 02 20 78 19 B7 20 DC 40 16C8: Ø8 09 CB CØ 28 DØ ØB 9B 91 20 98 58 1430: 03 4C 74 1190: AØ A9 1A A2 CE 17 Ø8 FØ 16DØ: FB A9 00 AØ 7F 99 38 ØB CB 17 1198: 19 A9 ØØ AB 99 BB 08 CB C4 AD 27 09 20 31 BD 1438: 13 18 60 16D8: 88 DØ FA A9 80 BD ØR 38 24 1149: CØ 78 DØ F8 20 A3 16 20 Cé 38 F9 97 CD 2C RF 20 1440: Ø8 3Ø Ø3 14FØ: 54 14 A9 01 BD 31 ØR. R9 11AB: 04 17 20 5A 16 A9 00 BD 21 1448: 99 FØ ØC 90 93 18 90 97 50 1AFR: AØ CO A9 1A A2 1E 4C 7C 51 2C Ø9 9Ø 60 18 Ø8 8D 19 Ø8 2C 2E ØB 79 99 95 11BØ: 1450: 69 94 CD 16FØ: 15 2C 54 CØ 20 51 CØ AD 1F 16F8: FØ 11B8: 30 06 20 60 12 4C F6 11 3F 99 8D 21 99 A9 78 8D 86 99 BE C9 4C DØ 1458: A9 Ø3 4C CF 31 4E 20 25 13 BØ 26 20 2F Ø8 F1 18 AD 20 09 6D 1700: 03 4C 00 BF AD 49 1100: 1460: 28 09 1F 98 ED 1468: Ø8 8D 2C Ø9 C9 2B CF 1798: 11CB: 10 13 20 3B 14 90 ØR 20 82 F9 30 60 BD 1E Ø8 29 20 FØ Ø2 BB 14 90 17 4C ØB 20 78 27 20 31 98 30 54 11DØ: 58 11 1470: **C9** 28 10 62 1710: A9 Ø1 AA BD CØ A9 38 **B5** 11D8: E9 14 20 A7 15 20 2E ØB 31 A9 95 20 A9 FE 18 6D D6 1718: BD 17 18 A9 18 8D 1478: 03 18 18 AF 11EØ: 10 09 20 39 15 20 72 16 09 148Ø: 2C Ø9 BD 27 99 C9 FC 30 BE 1770: A9 gg BD 1F ØR. AD 22 ØR RO F6 A9 99 8D 21 09 2D **C9** 28 30 05 A9 ØØ 8D 89 1728: ØA ØA 6D 22 Ø8 8D 22 ØB 70 11E8: 4C 11 1488: 94 1490: 26 09 20 90 16 20 04 17 6B 1730: 1E ØB 29 4Ø FØ Ø2 A9 C3 11FØ: 8D 28 Ø9 8D 2E Ø8 2Ø DD 8D AD

1738: 28 18 6D 22 Ø8 AA BD B8 6F 19D8: AØ Ø6 B1 FC 85 EE C8 B1 ØE 1C78: 00 00 00 00 00 78 7F 0F A0 1740: Ø8 FØ 1E BD BB Ø8 85 FC 54 19EØ: FC 85 FF AC: 1C Ø8 88 B1 7F 1080: 00 00 00 00 00 7E 7F 97 B8 1748: BD BC Ø8 85 FD BD B9 Ø8 4Ø 19E8: EE 4A 91 FF 88 30 03 20 72 1088: 00 00 00 00 00 7F 1750: 8D 07 08 BD BA Ø8 8D ØR FC 19FØ: 5D 1A 20 44 1B Ø8 EA 1A CE 1099: 99 99 99 99 99 7E 7F 99 CI 1758: Ø8 2Ø DC 17 A9 ØØ 9D BB EØ 19F8: DØ E9 AØ ØØ B1 FC 8D 1B D9 1078: 00 00 00 00 70 7F 99 7F 51 1760: Ø8 2Ø BC 18 DØ BF 49 1F A5 1AØØ: Ø8 AG Ø4 A5 FE 91 FC CB 30 1CAG: 99 99 99 49 7F 7F 7F Ø3 DA 1CA8: 1 AØR: A5 FF 91 FC AO ØR RI FC 94 18 38 70 7F 7F 7F 7F 87 A9 18 BD 18 18 FF 60 1768: 8D 17 18 Ø8 D9 1A1Ø: 85 EE C8 B1 FC 85 EF AC 81 1CBØ: BD 22 1F 38 70 03 7F 7F 7F 3D 1770: 49 90 8D 1F ØB 1A18: ØB 88 B1 EE 09 1C 8Ø 4A 6F 1CB8: Ø7 7E 41 ØF 7C 7F 00 00 ØF 1778: ØA ØA 6D 22 ØB AA BD Ø8 6C 1A2Ø: 91 FE 88 30 03 20 5D 1A 5E 1CCØ: ØØ 20 00 00 99 ØB 58 ØD 17 **3B** ØB 26 1780: 09 DØ Ø3 4C D6 BD 1A28: 20 44 1A CE Ø8 DØ E7 1008: 1B 30 96 49 77 3B 77 ØF 00 34 28 BD 09 85 FD A5 1788: 09 85 FC ØC 1A3Ø: A5 FC 18 69 ØA 85 FC 90 01 1CDØ: 77 ØF 99 20 44 20 00 Ø8 F4 1790: 99 97 ØB BD ØA B7 BD 99 8D 1A38: Ø2 E6 FD CE 26 Ø8 FØ Ø3 ØA 1CD8: 44 00 00 02 01 02 7F E1 8D ØB ØB AD 1F OR BD B7 1798: 09 1A4Ø: 4C C1 19 60 18 AD 1C Ø8 EB 1CEØ: 7F ØF 7F 7F 7F 63 Ø3 00 Ø8 8D 55 14 17AØ: 22 Ø8 ØA ØA 6D 22 1048: 65 EE 90 1CEB: 99 70 ØF 85 EE 02 E6 EF 99 99 D4 60 7F 00 9F 29 40 FØ D7 17A8: 22 ØB AD 1E Ø8 1A50: 45 18 AD 1C Ø8 45 FE 85 FE 31 1CFØ: 00 60 7F ØF 11 7F ØE 63 ØB AA 7F 17BØ: 92 49 28 18 6D 22 1A58: 90 02 E6 FF 60 B1 EE 90 1CF8: 11 7F 7F 38 7C 78 94 00 DA 9D A9 A9 Ø1 9D B8 Ø8 A5 FC 17B8: 1A60: Ø2 Ø9 8Ø 4A 91 FE 88 1Ø 36 1DØØ: ØØ 99 10 99 99 99 60 9D AD Ø1 6E 6B 17CØ: BB Ø8 A5 FD BC Ø8 1A68: F4 60 69 00 2C 1DØB: FF FF 5D 1B 79 6E 5D Ø3 60 26 70 6F F2 Ø8 90 B9 Ø8 AD ØB ØB DA 17CB: 97 1A7Ø: 1D19: D.3 C.3 CF D2 C5 BA AØ AØ A1 50 99 94 22 94 00 99 22 DD BC 8F 17DØ: 9D BA 98 20 DC 17 20 1A78: AØ AØ AØ CC C9 D6 1D18: 10 00 40 00 41 C5 D3 ØF 00 71 7F CE 99 B1 FC 96 17D8: 18 DØ 94 60 A0 1D2Ø: 1ABØ: BA AØ AØ AØ AØ AØ CB C9 **3B** 7F 7F 47 7F 7F 7F ØF 99 F2 8D 1B Ø8 C8 B1 FC 8D 10 F2 17EØ: 1D28: 99 40 Ø7 00 00 78 07 CD 1A88: C7 C8 AØ BA AØ AØ AØ AØ FB 90 43 17E8: ØB 8D 1D ØB AD Ø8 ØB BD 1D3Ø: 99 7E 71 98 71 7F 7F ØB 49 Ø8 29 Ø1 ØA 45 1A90: AØ CC C5 D6 C5 CC BA AØ E5 17FØ: 1A ØB AD 97 40 1D38: 47 7F 1F 3F 1C 7E 00 1A98: DØ D2 C5 D3 94 E8 69 02 AB B1 FC 85 EE CC AØ AØ AØ AØ 17F8: ØA 1D4Ø: 93 10 00 00 60 06 36 00 BA CE AØ D4 CF AØ D1 C3 FC 85 EF CB B1 FC FB 1AAØ: D3 AØ 1800: CB B1 1D48: 99 30 ØC 63 99 99 1F 38 RA FC 2Ø ØD 1AAB: D5 C9 D4 Ø1 F9 BØ CE 1A 6E 18Ø8: 85 FE CB B1 85 FF 1D5Ø: 43 97 99 18 AC 1D 08 88 20 FF 38 1ABØ: Ø1 27 80 DB 1A 01 FD 85 23 3B 6E 65 ØD 40 95 CF 1810: FF 6Ø B1 1A Ø1 27 85 EC 1A Ø1 1818: 20 4D 18 DØ F1 1AB8: E2 BC 1D58: 6D 3A 37 1R 40 4D AF 15 99 31 FC 8D 2F 18 92 1ACØ: 00 04 00 1B Ø1 ØØ Ø4 ØA C1 1820: EC 11 FE 1D6Ø: 1B 60 ØC 3A Ø7 33 60 1E 49 019 B1 EC 49 7F 31 EE 0101 F4 1AC8: 1B Ø1 12 ØØ F6 1A OD OR 4F 1D68: 45 37 ØØ 37 3A 91 1828: 6E 67 ØE 20 95 18 88 1Ø E7 BØ 1ADØ: ØØ ØØ ØØ ØØ 1E 1B 86 1B 8A 1830: 91 FC 1D7Ø: 40 61 6E 35 18 40 41 3A C2 1838: B1 EC 11 FE 31 FC 91 FC 20 1ADB: ØD 98 99 99 99 99 EE 1B 8E 18 60 99 05 98 1D78: 17 6E 30 60 F2 60 A5 24 1840: 20 95 18 88 10 1AFØ: 54 10 08 04 00 00 00 00 88 1D80: 60 39 3B 30 aa 38 20 40 25 1848: FC 8D 5C 18 A5 FD 49 60 7F 1AE8: BE 1C DE 1C Ø8 Ø4 ØØ ØØ 71 1D88: Ø1 ØØ ØC 28 Ø1 90 03 Ø6 61 FC 31 EC 11 54 57 1850: BD 5D 18 B1 1AFØ: 00 00 FE 1C 1E 1D 13 Ø5 1D9Ø: 28 Ø1 06 99 Ø3 20 99 ØC 84 91 FC 99 FF FF B1 FE FF 1AF8: 99 99 99 99 3E 90 1858: EE 1D 1D EB 1D98: 40 Ø1 B9 91 Ø8 18 7F 1F 78 91 EC 20 95 10 1 BØØ: 80 01 00 00 00 00 FC 1860: 49 7F 11 EC 1 D CD 1DAØ: 41 7F 7F OF 70 aa 7F 7F 3F 18 1868: 18 88 10 F7 60 18 AD 10 22 1 BØ8: 7C 1E 80 01 99 99 0505 99 24 1DAB: 07 21 ØB 7E 7F 40 03 **B2** Ø8 65 EE 85 EE 9Ø Ø2 E6 D8 1B1Ø: FC 1E Ø6 Ø2 ØØ ØØ B5 1879: 1D 7C 1DBØ: 79 3F 99 99 00 60 1F 00 B2 1878: EF 18 AD 1C Ø8 65 FE 85 77 1B18: 99 99 FC 1E Ø8 1F ØØ 00 8C 1DB8: 99 99 40 ØØ 1F 99 00 40 2D 1A ØB FA FF EE 1B20: 00 00 00 00 99 Ø8 ØØ ØØ 188Ø: FE 90 02 E6 76 1DCØ: ØF 60 99 30 99 ØF 40 99 5A 1888: CE 1B Ø8 AO FF 1F ØR AD 9F 1 R2R: 90 90 90 00 00 02 00 00 66 1DC8: 10 00 3F 99 99 99 69 D2 1F 60 1890: 1F Ø8 C9 ØB 20 6A 10 7E 1B3Ø: 99 00 99 99 40 99 60 7F AB 1DDØ: ØC 99 99 43 1F 10 99 40 EE 30 CØ 4A 90 ØA E4 1898: FØ Ø3 20 1B38: 7F 7F 7F 7F 13 00 99 7E ØD 1DDB: 43 ØF 99 70 ØE 7E 07 ØF 14 DØ Ø3 EE 6E 1A BE 1B4Ø: 7F 7F 7F 7F 00 9E 18AØ: EE 6D 1A 95 99 78 1DEØ: 99 99 97 7F 03 ØF ØF 7C E2 7F 7F 7F 1B48: 7F 18A8: A9 80 8D 68 1A CF 09 Ø8 5C 1D 00 00 2A 19 1DE8: 7F Ø3 30 78 7F 70 Ø3 Ø5 61 18BØ: DØ 1C A9 80 8D AB 1A AD 89 1850. 7F 7F 7F 3F 3D ØØ ØØ 28 10 1DFØ: 70 79 3F 78 ØF 7F 61 1F 4D 7F 7F 8D 1B58: 75 3F 7D 99 00 99 18B8: ØA ØR 99 ØB 4A 44 4A 76 F8 1DF8: 7C Ø3 70 43 20 20 20 20 D7 6D 6D 7E 18CØ: 38 49 FF 1A 8D 6D 92 1B6Ø: 55 7F 2F 75 02 00 00 77 1EØØ: 20 20 20 20 20 20 20 20 30 C9 1B68: 40 55 1808: BØ Ø3 CE 6E 1A 60 AD 2A 2A 55 02 ØØ 00 1A 49 1EØ8: 20 20 20 20 20 20 20 20 44 18DØ: Ø7 08 10 27 A5 FF 38 ED 42 1870: 40 02 05 0A 54 90 00 0303 2B 1E1Ø: 20 20 20 20 20 20 20 4C 20 18D8: Ø7 Ø8 85 EE 9Ø Ø2 E6 EF 78 1878: 50 00 05 0A 00 00 00 00 18 1E18: 20 20 20 20 20 20 20 20 54 18EØ: A5 FE 38 ED 97 Ø8 85 FE EB 1BBØ: 14 20 01 28 90 00 7F 7F F9 1E20: 20 20 20 20 20 20 20 20 50 18E8: 9Ø E6 FF AD ØB 1B88: 02 1D 18 CB 7F 7F 7F 7F 7F 7F 7F 63 4E 1E28: 20 20 20 20 20 20 20 20 64 1D Ø8 A9 ØØ CF 189Ø: 18FØ: 6D Ø7 98 8D 7F 7F 7F 7F 7F 78 7F 7F AA 1E3Ø: 20 20 20 20 20 20 20 20 6C 18F8: 8D 07 98 38 A9 28 ED 07 07 1B98: 7F 7F 7F 7F ØF ØØ 1F 7E 67 1E38: 20 20 20 20 20 20 20 20 74 1900: Ø8 CD 1D Ø8 BØ Ø3 BD 1D 97 1BAØ: ØØ ØØ ØØ ØØ 4Ø 7F 7F ØØ D5 1E4Ø: 20 20 20 20 20 20 20 20 70 1908: ØB AD 1A ØB 29 3F AB B9 BE 1BAB: ØØ 99 99 99 7F 70 7F 03 62 1F48. 20 20 20 20 20 20 20 20 84 1910: 1E Ø8 85 FD Ø9 38 19 ØD 7F 83 1BBØ: ØØ ØØ ØØ ØØ 40 7F 00 E5 1E5Ø: 20 20 20 20 20 20 20 20 80 1918: 60 85 ED AD 1A Ø8 29 Ø8 BF 1BBB: 00 00 00 00 00 7F 7F 1E58: Ø3 EE 20 29 29 20 20 20 20 20 1920: C9 Ø8 A9 99 64 20 1A ØB AF 1BCØ: ØØ 99 7E 99 99 99 7F 3F 2F 1E60: 20 20 20 29 20 9C 20 20 20 28 9A 1928: 10 02 69 50 50 02 69 7F 1BCB: 00 00 00 00 00 78 7F 5F 1E68: 20 20 20 20 20 20 20 29 A4 1930: 6D Ø7 Ø8 85 FC 85 EC 60 60 1BDØ: 1F 7F 99 99 99 90 78 7F FA 1E7Ø: 20 20 20 20 20 20 20 20 AC 14 1938: 99 04 Ø8 ØC 10 18 1C 40 1BD8: 1F 38 70 60 Ø1 7E 7F 7F 41 1E78: 20 20 20 20 ØF ØF ØF ØF **B4** 1940: 00 04 ØB ØC 10 14 18 10 52 1BEØ: Ø7 70 7F 3E 60 7E 7E 7F AA 1E8Ø: ØF ØF ØF ØF ØF ØF ØF ØF BC 1948: 01 05 09 ØD 11 15 19 1D 5A 1BE8: 41 ØF 70 Ø3 7F 1E88: 7F 40 00 ØF ØF ØF ØF ØF BD ØF ØF ØF C4 Ø5 Ø9 19 1950: 01 ØD 11 15 1D 62 1BFØ: ØØ ØØ 99 99 99 99 99 92 1F90: ØF ØF ØF ØF OF 29 ØF ØF ØF CC 1958: 02 96 ØA ØE 12 1A 1E 99 99 99 99 99 98 16 6A 1BFB: ØØ 37 1E98: ØF ØF ØF ØF ØF ØF ØF ØF D4 1960: 02 06 0A ØE 12 16 1A 1E 72 1000: 00 99 99 99 99 99 20 1EAØ: ØF ØF 99 58 ØF ØF ØF ØF ØF ØF DC 1968: Ø3 Ø7 ØB ØF 13 17 1B 1F 74 1CØ8: 7E 7F 7F 7F 7F 1F ØØ 99 1EAB: ØF ØF ØF ØF ØF BF ØF ØF ØF E4 1970: Ø3 97 ØB ØF 13 17 1B 1F 82 1C1Ø: 7D 7F 7F 7F 7F 03 00 1EBØ: 60 ØF ØF ØF ØF ØF ØF ØF 37 ØF EC 19 18 1978: BC A3 6A 6A ØB 18 A3 1018: 7D 7F 7F 7F 7F ØF ØF ØF 00 00 70 43 1FRR: ØF ØF ØF ØF ØF F4 19 BD A3 1980: 69 5Ø 6D A3 19 C2 1020: 75 7F 7F 7F 57 Ø2 ØØ 78 16 1ECØ: ØF ØF ØF ØF ØF ØF ØF ØF FC 1988: BD A6 19 28 A9 Ø3 2A BD ØC 1C28: 75 7F 7F 3F 55 ØF 99 99 3A C3 1EC8: ØF ØF ØF ØF ØF ØF ØF 05 1990: A4 19 69 Ø4 8D A7 19 60 66 1C3Ø: 55 7F 7F 2B Ø5 ØØ ØØ 1EDØ: ØF ØF 2A E7 ØF ØF ØF ØF ØF ØF ØD 1998: CA 80 AØ 19 BD 19 BD DB A1 1038: 55 2A 55 ØA ØØ ØØ ØØ 2B 19 1FDR: ØF ØF ØF ØF ØF ØF ØF ØF 15 9D FF 1940: FF FF 9D FF 1C40: FF FF FC 41 02 05 ØA. 99 99 99 ØØ DA 1EEØ: ØF ØF ØF ØF ØF ØF ØF ØF 1D 19AB: CA 10 F4 60 A9 CE 85 FC 79 1C48: 40 02 05 28 99 99 99 00 44 1EE8: ØF ØF ØF ØF ØF ØF ØF ØF 25 19BØ: 85 FD A9 1F F9 A9 1A 00 85 FE 26 1C5Ø: 50 99 14 20 01 00 1EFØ: ØF 7E ØF ØF ØF ØF ØF ØF ØF 2D A9 ØC 85 FF A9 ØB BD 26 22 1058: 7F 7F 7F 7F 7F 7F 7F 1EF8: 78 89 ØF ØF ØF ØF 10 99 10 00 F3 1900: ØB AØ 99 B1 FC 8D 1B Ø8 96 7F 7F 1060: 7F 7F 7C 10 7F 7F 7F 63 1FØØ: 99 10 00 10 ØØ 10 00 E8 1908: B1 FC BD 7C CB 10 Ø8 C8 A5 1068: 7F 7F 7F 7F 7F 7F 7F ØF 30 1FØ8: 47 7F 47 7F 47 7F 47 7F FØ 19DØ: FE 91 FC C8 A5 FF 91 FC 60 1C7Ø: 99 99 99 99 99 49 7F 3F E7 47 7F 1F1Ø: 47 7F FF FF 00 00 B2



Avoid the mammoth grasshopper in Apple "Webster Dines Out."



"Webster Dines Out" for TI uses sprites for the spider, scorpion and bugs.

Program 6: Webster Dines Out For TI

Translation by Patrick Parrish, Programming Supervisor

100 RANDOMIZE :: CALL CLEAR :: GOSUB 600 :: CALL S CREEN(2):: CALL MAGNIFY (3)

110 CALL HCHAR(1,1,114,32): : FOR T=30 TO 32 :: CAL L VCHAR(1, T, 114, 20):: N EXT T :: CALL VCHAR (3, 2 9,114,2)

120 CALL HCHAR (19, 29, 114, 2) :: CALL HCHAR (20, 28, 114 ,3):: CALL HCHAR (3,28,1 17):: CALL HCHAR (4, 29, 1 17)

130 CALL HCHAR(2,29,114):: CALL HCHAR(2,27,114,2)

140 CALL HCHAR (2, 1, 115, 25): : CALL HCHAR (2, 26, 117)

15Ø CALL HCHAR(19,28,112):: CALL HCHAR (19, 29, 113): : CALL HCHAR (20, 26, 112) :: CALL HCHAR (20, 27, 113

160 CALL VCHAR (5,30,118):: CALL VCHAR (6, 30, 116, 13) :: CALL HCHAR (21, 1, 104, 32):: DX=117 :: DY=9

170 LEVEL=1 :: LIVES=3 :: S CORE=0 :: E=0 :: BUGFL(3) = Ø :: BUGFL(4) = Ø

CALL SPRITE (#2, 100, 5, 14 5,1+RND*256,0,-15*RND+1 0)

19Ø DISPLAY AT(22,9): "LIVES :"; LIVES :: DISPLAY AT (

23,2): "LEVEL: "; LEVEL :: DISPLAY AT (23, 16): "SCO RE: "; SCORE

200 YPOS=OY :: XPOS=OX :: C ALL VCHAR (YPOS/8+2, XPOS /8+1,32,16)

210 CALL SPRITE (#1, 136, 14, Y POS, XPOS):: CCOL=25 :: CALL HCHAR (24, 4, 120, 25)

220 FOR L=3 TO 4 :: IF BUGF L(L) =Ø AND RND<.5 THEN CALL SPRITE(#L, 96, -(L=3) *11-(L=4) *5,145,1+198* RND, Ø, -5+RND * 10):: BUGF L(L)=1

23Ø NEXT L :: CALL MOTION (# 2, Ø, -15*RND+1Ø*LEVEL/2)

240 CALL KEY (Ø, K, S) :: IF S= Ø THEN CALL JOYST (1, XR, YR):: XR=SGN(XR)ELSE XR =(K=83)-(K=68)

250 COUNT=COUNT+LEVEL :: IF COUNT<10 THEN 330

260 CALL HCHAR (24, 4+CCOL, 32):: COUNT=Ø :: CCOL=CCO L-1 :: IF CCOL<>3 THEN 289

27Ø FOR K=1 TO 3Ø STEP 2 :: CALL SOUND (50, 1175, K): : NEXT K

28Ø IF CCOL<>-1 THEN 33Ø 290 LIVES=LIVES-1 :: CALL S PRITE (#1,140,14,YPOS,XP

OS):: FOR I=3 TO 17 300 CALL LOCATE (#1, YPOS+I*8 XPOS):: CALL SOUND (25, (23-I) *2Ø,3):: IF I<>17

THEN 320 310 FOR L=1 TO 800 :: NEXT

320 NEXT I :: IF LIVES=0 TH EN 710 ELSE 190

XPOS=XPOS-SGN(XPOS-5) *X R*(XR=-1)*16-SGN(197-XP OS) *XR* (XR=1) *16

340 CALL LOCATE (#1, YPOS, XPO SI

35Ø FOR L=3 TO 4 :: CALL MO TION(#L,Ø,-5+RND*10):: NEXT L

360 CALL KEY(1,K,S):: CALL KEY(Ø,K1,S):: IF (K<>18) * (K1<>32) THEN 220 ELSE COUNT=10

370 FOR I=3 TO 18 :: CALL H CHAR ((YPOS+(I-1) *8) /8, X POS/8+1,128):: CALL LOC ATE(#1, YPOS+I*8, XPOS)

380 IF I=18 THEN CALL COINC (ALL, C) ELSE 510

39Ø IF C=Ø THEN 51Ø

400 FOR L=2 TO 4 :: CALL MO TION (#L,Ø,Ø):: NEXT L

41Ø FL=Ø :: FOR L=2 TO 4 :: CALL COINC(#1, #L, 10, C)

42Ø IF C=Ø THEN 47Ø

43Ø IF L=2 THEN 45Ø

440 FOR K=9 TO 21 STEP 3 :: CALL SOUND (10, -1, K):: NEXT K :: CALL DELSPRIT E(#L):: E=2 :: FL=FL+1 :: BUGFL(L) = Ø :: GOTO 4 70

450 CALL SPRITE (#1, 140, 14, 1 44, XPOS):: LIVES=LIVES-1 :: E=1 :: CALL SOUND (5Ø, -6, 4):: FOR K=5 TO 1 5 STEP 5 :: CALL SOUND (10,-5,K):: NEXT K

460 FOR T=1 TO 600 :: NEXT T :: L=4

47Ø NEXT L :: IF E=Ø OR E=1 THEN 510

48Ø PTS=FL*25 :: PTS=-(PTS=

25) *25-(PTS=5Ø) *1ØØ :: SCORE=SCORE+PTS :: DISP LAY AT (3, 22) : SCORE

490 IF SCORE>=100*LEVEL THE N LEVEL=LEVEL+1+(LEVEL= 6):: DISPLAY AT (23,8):L EVEL;

CCOL=25 :: CALL HCHAR(2 4,4,120,25):: E=0

510 NEXT I

IF E=1 THEN CALL DELSPR 52Ø ITE(#1):: CALL VCHAR(YP OS/8+2, XPOS/8+1, 32, 16): : IF LIVES=Ø THEN 71Ø E LSE E=Ø :: GOTO 19Ø

530 FOR I=17 TO 2 STEP -1 : : CALL LOCATE (#1, YPOS+I *8, XPOS):: CALL HCHAR((YPOS+1*8)/8, XPOS/8+1,32):: NEXT I :: CALL LOCA TE(#1, YPOS, XPOS)

540 CALL COINC (ALL, C) :: IF C=Ø THEN 22Ø

550 FOR I=2 TO 4 :: CALL MO

TION(#I,Ø,Ø):: NEXT I FOR L=3 TO 4 :: CALL CO INC (#2, #L, 10, C1)

57Ø IF C1=Ø THEN 59Ø

58Ø FOR I=5 TO 15 STEP 5 :: CALL SOUND (10, -5, I):: NEXT I :: CALL DELSPRIT E(#L):: BUGFL(L)=Ø

59Ø NEXT L :: GOTO 22Ø

600 FOR T=112 TO 118 :: REA D A\$:: CALL CHAR(T, A\$) :: NEXT T

610 CALL CHAR (96, "000000000 ØØØØØØØØØØØØØØØ7ØF1F1212 99999999999999999999 ØFØF84848"):: REM BUG

620 CALL CHAR (100, "00003078 C4C@E@6@3@383B3F1F@F@9@ 40000000000000B103B204EFA FEF8F52291"):: REM SCOR PION

630 CALL CHAR (104, "FFFFFFFF FFFFFFF",128,"10101010 10101010",120,"00000000 0000FFFF")

64Ø CALL CHAR(136, "Ø3Ø7Ø5Ø7 Ø3Ø16397ØC3E4E1C6F87ØB3 ØCØEØAØEØCØ8ØC6E93Ø7C72 38F6E1DØØC"):: REM WEBS TER

650 CALL CHAR (140, "00000000 2Ø4448482F1F3F7B787B3F1 FØØØØØØØØØ1Ø884848DØEØF7 7D7F77EØCØ"):: REM WEBS TER2

660 DATA 000000031F3F7FFF,0 ØØF1F1FFFFFFFF, FFFFFFF FFFFFFFF, FFFFFFFØØØØØ ØØØ, ØFØFØFØFØFØFØF

67Ø DATA FFFFFF3F1FØFØFØ7,Ø FØFØFØ7Ø7Ø7Ø7Ø7

68Ø FOR I=2 TO 8 :: CALL CO LOR(1,15,1):: NEXT I

CALL COLOR(1,15,2,10,3, 1,11,7,1,12,5,1,13,16,1

700 RETURN

71Ø DISPLAY AT(22,15):LIVES :: DISPLAY AT (10,9): "G AME OVER";:: DISPLAY AT (12,5): "PLAY AGAIN (Y/N)?";

720 CALL KEY (0, K, S):: IF S= Ø THEN 72Ø

73Ø IF K=78 OR K=11Ø THEN E ND

74Ø IF K=89 OR K=121 THEN C ALL HCHAR (10,9,32,11):: CALL HCHAR (12,7,32,19) :: GOTO 170 ELSE 720

REVIEWS

The Hitchhiker's Guide To The Galaxy

Neil Randall

Requirements: Commodore 64 with a disk drive; Atari 400/800, XL, or XE with at least 48K RAM and a drive; Apple II-series computer with at least 48K RAM and a drive; Apple Macintosh; IBM PC, PCjr, or MS-DOS 2.0 compatible computer with at least 48K RAM and a drive; TI-99/4A with 48K RAM, a disk drive, and Extended BASIC or Mini-Memory or Editor/Assembler cartridge; or a Kaypro II with CP/M. Versions for the Apricot and Epson QX-10 are forthcoming.

The Hitchhiker's Guide to the Galaxy may well be Infocom's best effort to date. There are several reasons for this. First, the comic absurdity of Douglas Adams' popular radio/television/novel series translates well to Infocom's style of interactive fiction. Second, the story has a built-in sense of humor, which increases the player's enjoyment and reduces frustration. Third, the story itself is fascinating.

A best-selling novel and hit BBC radio series, later adapted for TV, The Hitchhiker's Guide to the Galaxy follows the hilarious adventures in space of Arthur Dent. Dent is an ordinary Englishman who one day witnesses the destruction of Earth (to make room for an Intergalactic Bypass). He eventually gets caught in the problem of finding the ultimate question to Life, the Universe, and Everything. The story is filled with absurd characters and wonderfully illogical events.

The narrative nature of *The Hitchhiker's Guide* is well suited to Infocom's text-only adventure format. In addition, Infocom's software boasts the industry's most advanced parser, that part of an adventure program which interprets the commands you enter. This means you can enter commands as normal English sentences and generally the computer will understand you. Infocom adventures take a long time to play, mainly because each contains several major puzzles you must figure out.

Comic Relief

Infocom's version of the story begins like the original series. Playing the role of Arthur Dent, you awaken to the sight of a bulldozer about to demolish your home. Solving this puzzle is quite easy, but the next major puzzle, aboard the Vogon spacecraft, is more difficult. In order to understand all alien languages, you have to find a way to get a Babel Fish into your ear (honest!). Although somewhat frustrating, this puzzle is entirely true to the humor of the radio series, and even if you don't solve it, you'll get several good laughs.

Humor, in fact, is the game's saving grace. It distinguishes *The Hitchhiker's Guide* from several other Infocom adventures. Most Infocom games take a long, long time to play, and for the most part you are simply solving puzzles. After awhile the puzzles may become frustrating, and in desperation you may begin seeking out other people to assist you in your struggles.

Not so with The Hitchhiker's Guide. I am committed to solving the thing myself, since I believe I have as small a grasp on logic as did the original series. I am far enough into the adventure to report that the game's humor consistently prevents you from becoming too frustrated. Adams' humor is sprinkled throughout, in descriptions (one object you find is "the thing which your aunt gave you which you don't know what it is") and in the actions of the characters and robots (Marvin the Paranoid Android never fails to elicit a laugh). For Infocom's version of The Hitchhiker's Guide to be successful, it had to be consistently funny and consistently absurd. Happily, it is both.

It also had to diverge from the series in one major respect: Arthur Dent's role had to change from spectator to major participant. In the original story, Dent is swept along by the strange happenings around him. But interactive fiction is strongest when your character can, to some degree, affect those happenings.

The role of passive observer does not translate well to an adventure program.

If it ever does, The Hitchhiker's Guide to the Galaxy may be redone with a different emphasis. But until then, Infocom has given us a thoroughly enjoyable rendition of a delightfully bizarre story. Recommended for all adventure gamers.

The Hitchhiker's Guide to the Galaxy Infocom, Inc.
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\$39.95 (all other versions)

Super-Text

Arthur Leyenberger

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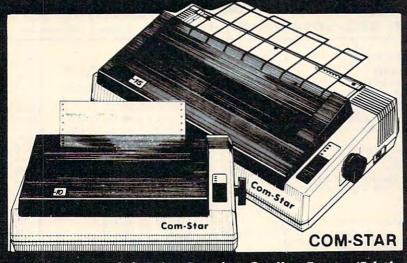
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Super-Text, from Muse Software, is a word processing program that can satisfy your writing needs even as they grow and become more sophisticated. Billed as a "professional" word processor, Super-Text was first released for the Apple computer more than two years ago and is now available for the Commodore 64, Atari, and IBM. The Commodore 64 version produces an 80-column display without any additional hardware.

The package consists of two identical program disks (a considerate policy), a comprehensive manual, and a quick reference card. The Atari program disk contains a special version of the Atari Disk Operating System (DOS) which permits access to all DOS commands from within the program. The disk also contains some predefined files which allow you to print your text on various printers—including those from Epson, Okidata, Atari, and NEC—and generic parallel and serial files so you can customize output to any other printer.

Special Printing

In addition to all the usual printing parameters, such as margin widths, page lengths, and lines per page, *Super-Text* also lets you define control key se-

quences for special printer features. A printer sequence code can be assigned to any of ten characters. You can then embed these nonprinting codes within your text to select such functions as superscripting, subscripting, ribbon colors, and alternate type styles. The manual contains several examples of how to set up your printer for these kinds of features.

In use, Super-Text is very similar to other word processors. To type, you enter a special "add mode." Word-wrapping and vertical-scrolling are automatic. To save text, you must exit the add mode and specify a filename; Super-Text adds the extender .TXT. Atari Super-Text files are in ASCII, so they can be read by other word processors or spelling-checker programs. Program files in ASCII format are also readable, as long as they have the .TXT extender.

To load a file, Super-Text first displays a numbered file directory of the disk. You can select a file by either its filename or number. This catalog screen also displays the name of the file in memory (if any), the current drive number, and the number of free pages remaining in memory. (On a 48K Atari, the maximum file size is 15K—about 15,000 characters.)

Super-Text contains a large number of flexible features. For example, the typical search-and-replace works either individually or globally, but also lets you specify wild cards, search for multiple strings, and search through any number of linked files on disk. The program even tells you how many occurrences were replaced. This lets you estimate the number of words in your document by globally searching for single spaces.

Programmable Keys

Another very useful feature is the ability to assign up to 30 characters to a single key. For instance, to write this review, I defined the string "Super-Text" as a programmable key. A single keypress then saved me from typing the phrase each time. This feature can be toggled on or off

We can't list all the many features of *Super-Text* here because it's such a powerful program. It offers block operations, onscreen formatting and print previewing, soft and hard tab stops, headers, footers, auto page numbering, paragraph identation, centering, underlining, and much more.

Super-Text is easy to use, has excellent documentation with numerous examples, and contains just about all the features a novice or serious writer might need.

I cannot think of any serious faults or omissions in *Super-Text*. If you are looking for your first word processor or want to upgrade to one with more horsepower, *Super-Text* is definitely worth considering.

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War In Russia

Neil Randall

Requirements: Atari 400/800, XL, or XE with at least 48K RAM and a disk drive; or an Apple II-series computer with at least 48K RAM and a disk drive (the Apple II+ requires Applesoft ROM).

The most important thing that can be said of a war game, whether it is simulated on a board or on a computer, is that it "feels right." For a war game to feel right, it must reflect the historical conditions and the scope of the battle it simulates, and it must make the player understand the difficulties encountered by the actual commanders as they made their decisions. Computerized war games have an inherent advantage over board games in this respect because of their ability to handle the nuts-and-bolts details of supply, equipment repair, and so forth. Unfortunately, computerized war games seem to rarely exploit this advantage. But War in Russia, an advanced-level game from Strategic Simulations, does much to correct that

Played on a scrolling hex-map of the Soviet Union, War in Russia is a oneor two-player game dealing with the German invasion of 1941-45. War in Russia includes three scenarios (along with a campaign game) which cover the entire war and take many hours to play. Maneuverable units are battle groups of up to six divisions, with the distinction between tank and infantry formations. This allows you to reenact the breakthrough/encirclement tactics which characterized the blitzkriegs of World

Several features contribute to a detailed but surprisingly easy-to-play system. The Reinforcement/Experience/ Fatigue system provides the feel of combat on a divisional level, yet is handled simply. Prolonged combat increases the fatigue of a unit until it stops to rest. At the same time, units gain experience during combat, increasing their battle efficiency. When you reinforce a depleted unit, though, its experience level drops to reflect the addition of the "green" troops. Learning to exert some control over these processes gives you the feel of making real command decisions. If you don't make the proper adjustments, your offensive quickly grinds

The Production Factor

Some of the fascinating aspects of War in Russia are watching the combat effectiveness of your units wax and wane, resting your panzer divisions just long enough to prepare them for the next battle, and conserving your units' strength during battles in the winter. The German player, as happened historically, watches initial successes stopped by the coming of the first winter, while the Russian player must build an effective defense using weak and inexperienced troops. Both players must plan well ahead to keep their units fresh and at the highest possible strength and effectiveness. For both it is a great challenge.

Production is a major facet of the game, just as it was in World War II. Each nation may use its production capacity to build artillery, vehicle, or aircraft factories, or divert some capacity to increase the overall production level of the country. These economic decisions are difficult because their effects will not be apparent for months to come, and because they have a strong impact on strategy. This feature is quite easy to use, and is another indication of the game's concern with the war as a whole.

War in Russia provides as accurate a model of the Russo-German campaign as any game I've seen, on board or on computer. Its duration and the size of its map lend a sense of the war's scope, while the production and combateffectiveness systems provide you with the ability to make major decisions which change the course of the game.

Anyone who enjoys a solid analytical challenge will find hours of enjoyment here, and war-gamers should consider War in Russia a must. It operates not only on the operational level of military command, but also in the realms of strategic and economic policy. And above all, it feels right.

War in Russia Strategic Simulations Inc. 883 Stierlin Road Building A200 Mountain View, CA 94043

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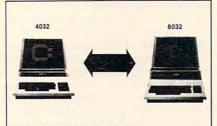
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Raid On Bungeling Bay

James V. Trunzo

Requirements: Commodore 64, a disk drive, and a joystick.

Home arcade games face a tough fight in today's software wars. After two years of being saturated with a variety of shoot-em-ups and maze games, a more sophisticated—and somewhat jaded—game player has emerged. And that player is a difficult customer to satisfy. But *Raid on Bungeling Bay* possesses all the virtues necessary to appease the demanding gamer.

The theme is simple. The Bungeling Empire is preparing the ultimate weap-on of war for conquering the world. Its six war factories, each located on an industrialized island, are preparing for the invasion. Only you, a highly skilled helicraft pilot, have a chance to prevent the unthinkable. You must bomb the war factories and destroy the Bungeling war machine.

But your mission is about the only thing in Raid on Bungeling Bay that is

ordinary. From the moment your highly mobile, heavily armed helicraft takes off from its aircraft carrier, there's enough action to please even the hardest-core arcade addict. Flying over beautifully rendered, 360-degree scrolling screens, you attack the Bungeling factories. They are guarded (of course) by tanks, boats, fighter planes, bombers, and radar. In addition, somewhere among the islands, the Bungelings are building a battleship complete with heat-seeking missiles that, if launched, are sure to spell your doom.

Is it necessary to destroy everything or just the factories? Everything! All elements have their purpose in this game. Radar, for example, helps enemy planes locate your position and attack. Tanks and artillery defend the factories. Boats carry supplies to help rebuild what you have destroyed.

The graphics are amazingly detailed. Smoke pours from the stacks atop the factories, helicraft blades whirl, heat-seeking missiles are propelled on shafts of flame, and radar installations explode like fireworks. If you're skilled enough to complete your mission (I never was), you are rewarded with more graphics—a hero's welcome in the form of a victory parade and a newspaper account of your raid.

Learning to control your helicraft takes some practice, as it is extremely sensitive and maneuverable. You are given five helicrafts at the beginning of the game. Each craft can absorb 100 points in damage before being destroyed, and the craft can return at any time to its carrier for a new bomb load and repairs—that is, if the carrier isn't under attack. Didn't I mention that possibility before? Well, it doesn't matter. You'll find out about this and other surprises when you play Raid on Bungeling Bay yourself.

Raid on Bungeling Bay Brøderbund Software Inc. 17 Paul Drive San Rafael, CA 94903 \$29.95

Sundog: Frozen Legacy

James V. Trunzo

Requirements: Apple II-series computer with at least 64K RAM, a disk drive, and a two-button joystick.

First, take equal portions of *Star Wars* and *Star Trek*, mix in a dash of mystery and the unknown a la Infocom's *Planetfall*, and add just a hint of arcade action. Next, pour these ingredients onto a 5½-inch floppy. Finally, boot the disk as often as you like, and enjoy for months one of the most entertaining and absorbing role-playing games on the market today.

Sundog: Frozen Legacy is a refreshingly different, graphics-oriented space game. It seems simple enough at first. You have inherited a serviceable but rundown one-man star freighter named the Sundog from a little-known uncle who has died (mysteriously). You have also inherited his obligation: to help build a colony for a religious group. You must establish the colony somewhere on the planet Jondd; find, buy, and de-

liver all goods needed for construction; and locate and deliver cryogenically preserved colonists who are being kept in warehouses in various cities somewhere within the Drahew Region.

But to complicate matters, you have no knowledge of trading, little knowledge of piloting the spacecraft, and the Drahew Region is *huge*. The designers of *Sundog* were ambitious, to say the least. The Drahew Region consists of 12 star systems with 18 inhabited planets—and those 18 planets are dotted with more than 900 populated cities.

Perhaps the most innovative aspect of *Sundog* is its liberal use of screen windows. The graphics range from excellent to adequate depending on which screen is in play (pilotage, tactical, onland travel, etc.), but the windowing makes this program truly enjoyable to play.

Another nicety in Sundog is the variety of responses and interplay among the various people you meet. Bartenders can be very friendly when you are

spending money, but curt when they feel you are wasting their time. Merchants (and even local toughs) can be bargained with, threatened, and so on, and each approach produces different results. This brings a feeling of individuality to your encounters and adds flesh to the body of the game.

Sundog allows you to save up to eight games on a disk and displays the status of each game (suspended, in play, or completed). You may, of course, delete entire games from the disk to begin new adventures. Written in Apple Pascal 1.1, the program handles its many sophisticated features quickly and reliably. Sundog is a game that can be played over and over again, even after the initial tasks have been solved.

Sundog: Frozen Legacy FTL Games 7907 Ostrow, Suite F San Diego, CA 92111 \$49.95

Enhancements To BASIC For Atari

Tom R. Halfhill, Editor

Requirements: Atari 400/800 with 48K RAM, a disk drive, and Atari BASIC cartridge; or a 1200XL with a disk drive and Atari BASIC cartridge; or a 600XL/800XL with 64K RAM and a disk drive.

Enhancements to BASIC is an impressive utility that provides more than 40 new commands for BASIC programming. It isn't an "extended BASIC"—that is, it doesn't add any special keywords for inclusion in your programs. Rather, it's a tool kit utility that makes programming and debugging easier and more efficient. Best of all, it frees you from worrying about the infamous lockup bug which has haunted Atari BASIC programmers for years.

Before using Enhancements to BASIC, you must follow a 25-step setup procedure carefully described in the manual. First, Enhancements copies your Atari BASIC cartridge (400/800/ 1200XL) or built-in BASIC (600XL/800XL) into Random Access Memory (RAM). Then it modifies BASIC, adding the new commands and fixing the bug which can unpredictably lock up the Atari during program editing. Finally, Enhancements copies itself onto another disk for future use. From then on, you simply boot up the modified BASIC from this disk, either removing the BASIC cartridge if you have a 400, 800, or 1200XL, or holding down OPTION to disable the built-in BASIC on the 600XL/800XL.

Most of the new features are fairly standard for utilities of this type. There are commands for automatic line-numbering and renumbering, deleting blocks of lines, listing all variables, searching for lines containing a certain variable, globally changing variable names, and sending screen output to a printer. There are disk commands which lessen the need to exit BASIC to DOS: You can call disk directories, rename files, lock and unlock files, delete files, format disks, and run a machine language program at a certain address.

That would be enough for most tool kit utilities. But Enhancements adds some more exotic features. There are commands to restore, rename, and call directories of deleted disk files. Another command protects BASIC programs by making the listings unreadable but executable. You can lock the keyboard to prevent tampering until a personal authorization code is entered. You can change screen margins and the delay period before keys begin repeating. On a 600XL/800XL, you can change the key-

repeat rate and turn the keyboard click on and off. You can display numeric values in decimal or hexadecimal (try renumbering a BASIC program in hex!). There are even programmable function keys—for example, pressing CTRL-4 automatically prints LOAD"D: or anything you like.

But perhaps the most powerful enhancement is the tracer/debugger. Most TRON/TROFF (trace on/off) utilities simply display the line numbers being executed as the program runs. Enhancements displays the entire line, and lets you flip back and forth between the scrolling listing and the actual program running simultaneously on an alternate screen. Implementing this feature on a computer with only 48K or 64K of RAM is quite impressive. Memory conflicts sometimes prevent you from tracing very large or complex programs, but nevertheless, the tracer does a remarkable job of handling such memoryjuggling challenges as player/missile graphics, custom character sets, and machine language subroutines. You can also disable the tracer to conserve memory.

There are still more features we don't have room to cover, such as a handy help screen. *Enhancements* is an exceptional product.

Enhancements to BASIC First Byte P.O. Box 32 Rices Landing, PA 15357 \$14 95 (includes shipping & h.

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THE BEGINNER'S PAGE

Tom R. Halfhill, Editor

FOR-NEXT Applications

Last month we covered the basics of looping with the FOR-NEXT statement. Now let's take a look at some practical applications of this essen-

tial technique.

FOR-NEXT is such a generalpurpose structure, it has numerous uses. Here's an example of how you might apply it in part of a checkbook-balancing program that sums the amounts for a month's worth of checks:

10 PRINT "HOW MANY CHECKS THIS MONTH";

20 INPUT CH

30 FOR X=1 TO CH

40 PRINT "AMOUNT OF CHECK";

50 INPUT AM

60 SUM=SUM+AM

70 NEXT X

80 PRINT "TOTAL AMOUNT IS \$";SUM

Let's take a careful look at this program. Try running it. Line 10 prompts the user to enter the number of checks to be added; line 20 stores the response in the variable CH. Line 30 is a little tricky. It marks the beginning of the loop with a FOR statement as shown in last month's examples, but the number of repetitions specified is a variable, not a number.

The variable, CH, contains the number of checks the user entered in response to the prompt. Therefore, the number of times the FOR-NEXT loop will repeat depends on the user's response. In effect, the program adapts itself to the user's needs. Think of what would happen if you specified the number of loops with a certain number, say 10. If the user has only 7 checks, the program would make too many loops, demanding amounts for 3 checks that were never written. If the user has 23 checks, the program would add only 10 of them together, ignoring the remaining 13.

Line 40 prompts the user to enter the dollar amount of the first check (do not type a dollar sign). Line 50 stores the response in the variable AM. Line 60 creates the variable SUM to keep track of the total and adds AM to SUM (when the first pass through the loop begins, SUM equals 0).

Line 70 marks the end of the loop. It circles back to the FOR statement on line 30. Now the loop begins its second pass. Again, a prompt asks the user to input a check amount. Again, the response is stored in the variable AM (replacing the previous amount for the first check). Again, AM is added to SUM, so SUM now contains the cumulative amounts of the first and second checks. And again, at line 70, NEXT X circles back to line 30 for the third pass.

This continues until the number of loops specified by CH is reached. Then the loop is done and the program proceeds to line 80. The program prints the total amount held in SUM and ends.

This example shows two things: first, the usefulness of FOR-NEXT loops when combined with other techniques, such as INPUT statements; and second, the flexibility of FOR-NEXT loops when modified slightly, such as specifying the number of loops with a variable instead of a particular number.

Speed READing

One of the most common applications of FOR-NEXT loops is to combine them with the READ and DATA statements. (If you aren't familiar with READ-DATA, don't worry; it's a subject for a future column.) By embedding a READ statement within a loop, you can efficiently fill an array with DATA, or POKE numbers for custom character sets or machine language subroutines into memory.

Let's try a simple example. Say you're writing some sort of calendar program that requires the computer to print a column of numbers representing the number of days in each month of the year. Without looping, you could take this approach:

10 PRINT "31"
20 PRINT "28"
30 PRINT "31"
40 PRINT "30"
50 PRINT "31"
60 PRINT "30"
70 PRINT "31"
90 PRINT "31"
100 PRINT "31"
110 PRINT "30"
120 PRINT "31"

But a FOR-NEXT loop with READ-DATA is much more efficient:

10 FOR X=1 TO 12 20 READ A 30 PRINT A 40 NEXT X 50 DATA 31,28,31,30,31,30,

31,31,30,31,30,31

Line 10 sets up a FOR-NEXT loop with 12 passes (the number of elements in the DATA statement at line 50). Line 20 reads a number from the DATA statement and

stores it in the variable A.

Line 30 prints the value of A, which changes after each pass through the loop. During the first pass, A equals 31 (the number of days in January) because 31 is the first DATA element. During the second pass, A equals 28 (the number of days in February) because 28 is the second DATA element. This continues for all 12 passes, concluding when A is assigned the value 31 for the twelfth month, December.

Next month, we'll continue our discussion of FOR-NEXT by showing how to put loops within loops, and even why you might want to create a loop that does absolutely nothing. We'll also cover some variations of FOR-NEXT in different versions of BASIC.

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Computers And Society

David D. Thornburg, Associate Editor

Expert Systems And The Mass Market Micro

A few months back I raised the controversial notion that, contrary to the views of the pundits, the home computer industry hadn't died. In fact (and here's where the criticism came), I argued that the true "home" computer market had yet to be born.

My point was that personal computers are unlikely to penetrate much more than 10 percent of American homes until they become as easy to use as much of the other technology we find in our homes. I agree it is silly to expect a personal computer to be as easy to use as a clothes dryer. On the other hand, why should it be any harder to use than a video disc player, especially when the video player contains more complex technology than is found in most personal computers?

Before home computers become commonplace, we must also create home software applications that will allow the computer to advance beyond the stage of being a tool for writing or record-keeping. Imagine sitting at your computer in the middle of the night and engaging in the following dialog with your home computer:

What seems to be the problem?

My child just woke up and says
he itches. He has red splotches on
his face.

Red splotches can indicate many things. Please call your child's doctor now. If the doctor has to call you back, please continue to answer my questions while you are waiting for the call to be returned. Are the red splotches located on other areas of the body as well?

Yes, there are some small ones on the chest.

Did your child eat any of the following foods in the last eight hours: oranges, strawberries, chocolate?

Yes, we had ham with an orange peel sauce for dinner.

Has your child ever displayed an allergic reaction to orange juice?
[And so on.]

Applying Artificial Intelligence

This hypothetical interaction could help save a family member's life, or at least reduce discomfort. Such programs—which can help solve problems ranging from diagnosing an illness to selecting the correct wine for dinner—are called expert systems.

Expert systems are one of the current commercial applications of research in the field of artificial intelligence. Up to this point, most expert systems have been run on fairly large computer systems, and they have been applied to massive computational tasks such as choosing the correct location for offshore oil wells.

Creating an expert system requires close interaction with human experts who are able to express their own decision-making process in terms of rules. Each rule is generally expressed in the form: IF (conditions are true) THEN (result is likely). Many of the more sophisticated expert systems have ways of dealing with imprecise information—assigning likelihoods to various results depending on the certainty with which the conditions are known.

The expert system program contains this set of rules (which can range in number to well over 100). The program also contains another part called an *inference engine*. The inference engine decides which rule to apply to the various information that has been entered, knows when to ask for more information, and infers a result. Once an expert sys-

tem has drawn a conclusion, the user can usually enter a command such as WHY?, and the system outlines the various rules and information it used to get its result. Mathematically speaking, such programs can prove themselves.

Ferns Versus Roses

Anyone can probably list several applications for expert systems: home medicine, car problems, plant choices for the garden, choosing the right stereo, and even picking the right computer!

As home computers acquire more memory and disk storage, expert systems will become commonplace. Artificial intelligence languages such as PROLOG and LISP are now being readied for the personal computers many of us already have, so there is no technological reason that expert systems won't become a reality in our country in the next two years.

Consider that in Britain, PRO-LOG is available on the inexpensive Sinclair Spectrum+ for under \$40. According to Sinclair, this language is selling well, and is being taught to school children who are using it to build their own expert systems. The current interest in teaching database skills in our country is a refreshing step in the right direction.

The birth of the true consumer market for computers (a market in which computers will become as commonplace as televisions) will come very soon. We who have used personal computers since the 1970s and early 1980s will be fondly remembered as the pioneers of the true information revolution.

And, to the extent that we create useful applications for these machines, we may become shapers of the revolution as well.



On The Road With Fred D'Ignazio

Bits, Bytes, And Black Sheep

Late last fall I attended the Bits & Bytes Show at the Disneyland Hotel in Anaheim, California. Bits & Bytes was the first national computer conference for kids, and I was there to cover it for COMPUTE! and for two PBS shows—"The New Tech Times" and "Educational Computing."

The show was a terrific success—especially for children. Thousands of kids came, played with the newest computers and robots, and got a chance to tell the bigwigs of the computer industry what they thought about their products. For example, one little girl, Kimberly Williams, returned from the show and wrote to the conference organizers: "Thank you for inviting my class to the computer show. It taught me and my friends a lot about computers. The computers were very learningful to my brain."

At the show, I gave a presentation on a favorite topic of mine: the ways in which a computer could become a "sandbox" for little children. I also made a few critical remarks about the programming language Logo. I said that although I enjoy programming in Logo, I don't think computer languages are especially appropriate for younger children because the rewards are not commensurate with the amount of effort required. Also, I said that the Logo environment is somewhat artificial, abstract, and not meaningful to a small child.

Angry Reaction

I had made similar remarks at other conferences, so I didn't expect the kind of reaction I got. What a shock! Ten minutes into my talk, people in the front row rose to their feet and furiously denied that anything I had said was true. They were teachers who had been teaching Logo to their classes at school, and they said their experiences had been exactly the opposite of my own.

After listening to their point of view for a few minutes, I asked other members of the audience if they agreed. By the end of the session (which turned into a free-for-all debate), I learned that there are many different points of view about Logo and very few points of universal agreement.

However, my feelings about the Logo controversy were strengthened the other night when I picked up a copy of an excellent Canadian magazine, Computers in Education, and read an article by Elias Leousis, a teacher and the founder of the first full-time computer literacy program at the elementary level in the province of Quebec. In the article, entitled "Black Sheep and Logo," Leousis wrote that "Logomania" is starting to become a cult. Leousis himself uses Logo to teach programming skills, but he worries about the absurd claims made by some of Logo's admirers. "As a result of such claims," he wrote, "disillusioned educators, having followed the 'Logo route,' may cause an anti-computer backlash, destroying all advances made in the area of introducing computer literacy in the education field."

People Inside The Machine

A few years ago, I wrote a book introducing computers to children. I interviewed dozens of computer pioneers, including J. Presper Eckert, who along with John W. Mauchley invented the ENIAC, the granddaddy of today's electronic digital computers.

I wanted to call the book *The People Inside the Machine* because I concentrated on the inventors and the excitement and joy they had received from working on computers. The book showed youngsters how real people with hopes, dreams, and frailties had built computers, step by step, over many, many years. By showing the people inside the ma-

chine, I hoped to encourage young readers to see a reflection of themselves inside machines of the future. The book's message was that inventions like the computer may require a dash of genius, but even more important are hard work, a playful imagination, devotion, and stubborn, mulelike persistence in following through with your own ideas and magnificent obsessions.

As it turned out, the book was retitled Messner's Introduction to the Computer (Simon & Schuster, 1983), but it's still oriented to young people. If you're a grownup who wants to read about the people inside the machine, I recommend Tom Mahon's new book, Charged Bodies: People, Power, and Politics in Silicon Valley (NAL, paperback, 1985). Mahon's account is one of the most honest, eloquent, and fascinating books I've read in a long time. You learn about computer technology-the semiconductors, microchips, operating systems, and Winchester disks-but Mahon weaves the technology into the lives of the industry's famous and obscure pioneers, and has made what could have been a dry history of computers into a very interesting story.

Mahon doesn't pull any punches, either. He devotes equal attention to the dark side of computers as well as the light side. And he does it all in a vivid style reminiscent of Tracy Kidder's Pulitzer Prizewinning Soul of a New Machine (Little, Brown, 1981).

This book is an excellent primer on computer technology and the computer industry, and it will make a good computer literacy text for high school and college introductory courses on computers.

Fred D'Ignazio loves to get electronic mail. Here are his electronic mailboxes: The Source (BCA638); Compu-Serve (75166,267); MCI Mail (Fred D'Ignazio); and EasyLink (62856637).

TELECOMPUTING TODAY

Arlan R. Levitan

Inside XMODEM

Last month we covered the basics of uploading and downloading and how the XMODEM protocol developed into a system for reliably transferring files over phone lines. Now let's take a look inside XMODEM to see how it works.

XMODEM requires certain communications settings (eight data bits, no parity, one stop bit). Some terminal programs set these parameters automatically during XMODEM transfers. Others require you to set

them manually. XMODEM transfers files by sending and receiving them in blocks. Each block consists of five elements: a special character that marks the beginning of the block (called a start of header character); a number which identifies the sequence number of the block (incremented by one for each block sent); a number which insures the block number is correct; a 128-byte chunk of the file being transferred (the file is chopped up on the sending end and reassembled on the receiving end); and a number to verify that the 128-byte chunk of data received is the same as was sent. This number is called a checksum. It is the sum of the hexadecimal values of all 128 characters.

Downloading

After notifying the remote system that you want to download a certain file with XMODEM, the other system prepares the file for transmission and then waits for your signal that things are ready to begin. When you instruct your terminal program to begin the transfer, it sends an acknowledgment signal consisting of a single character called an ACK. The first ACK means "ready for next block."

The remote system then sends a block to your computer. Your terminal software looks for the start of header character, then checks the block number for both validity and proper sequence. Next it examines

the 128 bytes of data and calculates a checksum. It compares this to the checksum actually sent by the remote system; if both are the same, it assumes the data was transmitted without errors.

As each block is successfully received, another ACK is sent. If an error is detected or the next block is not transmitted after a certain amount of time, your terminal program sends a character referred to as a NAK (negative acknowledgment). A NAK means, "I think we had a problem with the last block; please resend it." The transfer is aborted if a single block must be resent more than an agreed-upon number of times (usually ten). When the transfer is complete, the remote system sends a signal called EOT (end of transmission).

Nonstandard Protocols

Although the original standards for XMODEM file transfers are well established, not all terminal programs that advertise XMODEM capability actually conform to the standard. Here is an example of what can happen (the names have been changed to protect the innocent):

The Bitblaster computer has been available for about a year. Some kindly soul, intent upon putting far-flung Bitblaster owners in touch with each other, writes a bulletin board program for the new machine. Since he wants to encourage people to share programs for the Bitblaster, he includes an XMODEM feature. His friend writes a public domain terminal program with XMODEM capability and starts passing it around.

What they don't know is that their implementation of XMODEM was not strictly by the book. But since the terminal program and BBS work fine together, no one notices. The number of Bitblaster BBS systems rapidly multiplies, and there are thousands of copies of the free terminal program in use.

However, when Bitblaster owners start using the terminal program on other systems, they discover—much to their chagrin—that the good ol' XMODEM feature doesn't work too well on non-Bitblaster BBSs. When something like this happens, it can take years for everyone to agree on a common fix for the problem. Even commercial telecomputing packages are written by normal people, perfectly capable of making such mistakes.

Other Problems

Commercial information services are not well suited to XMODEM transfers. The protocol was developed for microcomputer-based BBSs which handle only one user at a time and can therefore devote all of their attention to the transfer. On a commercial service, hundreds of users may be logged on simultaneously, and the mainframe computer gives each user only a certain amount of attention for a certain time period.

The only way to make XMO-DEM work on the information services was to relax the timing standards. However, this severely limits the ability to recover from bad blocks and out-of-sync acknowledg-

ment signals.

Although errors are relatively rare, many terminal programs and information services offer their own transfer methods in addition to (or instead of) XMODEM. There's only one hitch—often this means both computers involved in the transfer must be running the same terminal program, or in the case of information services, a terminal program written and sold by the service for your particular system.

Next month, as promised earlier, I'll show you how to save money when sending E-mail by composing your messages offline and then uploading them to the host computer. Until then, BCNU.

IBM Personal Computing

Donald B. Trivette

Escaping On A LaserJet



This Hewlett-Packard LaserJet printer is shown hooked up to an HP 150 computer, but it also works with the IBM PC and compatibles.

I got a letter last month from my friend who has a covey of computers in his spare bedroom. Five at last count! We've had a friendly rivalry going for years. I bought a pocket calculator, and he bought an Apple III. I got an IBM PC first, but he got a bigger one—the XT. I bought a PCjr, so he got a PCjr and, a few months later, the PC AT. Now he sends me this letter: "This is the first letter ever written with my Apple Imagewriter and Macintosh computer...it sure is fun to play with the font sizes and styles and formats..."

The font he was experimenting with looked like a cross between stencil letters and something a monk in the Middle Ages might have laboriously drawn with a quill—right justified, of course. Having run out of IBM equipment to one-up me with, he has switched to Apple. The letter isn't easy to read, but it is flashy. I thought about going to the Apple store and trying out a Macintosh long enough to answer his letter, but I needed something better than that—something better than IBM or Apple.

A Printer Or Copier?

It was about this time that Hewlett-Packard called to say they had a LaserJet printer for me to evaluate. Although it arrived at the airport, the LaserJet looked more like an office copying machine than an airplane. And for good reason—that's mostly what it is. The data from the computer is etched on a drum by a

laser, and then transferred—one page at a time, eight pages per minute—from the drum to the paper. There's a tray for blank paper, a cartridge for toner, and a manual to show you how to fix a paper jam. Anyone who has used a copying machine will feel right at home with the LaserJet.

Connection was easy. I unplugged my Hayes modem and plugged the LaserJet cable into the modem cable. Typing two DOS commands told the PC to forget my parallel printer and talk instead to the LaserJet, which is a serial printer.

Using the LaserJet takes a little getting used to. You send something to the printer and nothing happens-at least, it doesn't look or sound like anything is happening. There's virtually no noise except for a quiet fan. And nothing immediately pops out. The printer etches the text on the drum and then waits for the page to fill up before transferring the data to paper. If you want to print a partial page, you press the form feed button. Once you've mastered the idea that printing and noise are not related, the LaserJet operates much like any other printer. (In fact, it's so much fun that I lasered a whole ream of paper playing with it.)

The print quality is superb. Although the characters are formed with tiny dots, like a dot-matrix printer, the 300×300 dots-per-inch resolution is so fine that you need a magnifying glass to prove how it was done. The quality of the print is

A sample printout made with the LaserJet.

Hi David --

I got your letter and was surprised to hear that you bought a Macintosh. The Imagewriter does a fancy job of printing even if it is a little difficult to read.

1. Personally, I've found this 8-point type very useful for footnotes. Does the <u>Imagewriter</u> support anything like this?

better than that of my NEC 3550 printer, which has fully formed characters and uses a film ribbon. But in a duel of one-upmanship, quality isn't enough. You've got to have sizzle. The Hewlett-Packard LaserJet has plenty of sizzle.

Custom Printing

Different type styles (fonts) are available by plugging a Read Only Memory (ROM) cartridge into the front of the printer. Each cartridge—about the same size and shape as the old eight-track audio tapes—can store up to 16 fonts, although the one I used had only eight. To select a font, you simply send a special character sequence (called an escape sequence) to the printer.

The LaserJet is more powerful than most printers, so the escape sequences are somewhat longer and more complicated. For example, to enable bold printing, the sequence on my NEC 3550 is escE (where esc represents the escape character, ASCII 27). On the LaserJet, the equivalent command is esc&10Oesc(0Uesc

(s1p10v0s1b5T.

The LaserJet is a relative bargain at \$3,495, considering its power and new technology, but only if you can easily take advantage of all its features without having to resort to these huge escape sequences. Fortunately, some programs are appearing which relieve you of this burden. The Volkswriter Deluxe, Version 2.1 word processor has a printer driver especially designed for the Hewlett-Packard LaserJet printer that does a splendid job.

The accompanying figure shows part of the letter I sent to my friend to demonstrate some of the nice things the LaserJet with Volkswriter Deluxe can do. I didn't mention to him that the printer had to be returned to Hewlett-Packard at the end of the month. Since I haven't yet received a reply, I expect he's measuring his spare bedroom for a mainframe.

Bill Wilkinson

Analyzing The BASIC Bug

Last month I showed some ways to minimize the problems caused by the bugs in revision B Atari BASIC (the built-in BASIC in the 600XL and 800XL). But many of you are curious about exactly *why* these bugs happen, and what effect they can have on your programs.

Let me begin by telling what did not cause the error. Rev B BASIC has a peculiar problem: Each time you LOAD (or CLOAD or RUN "filename") a program, rev B adds 16 bytes to the size of your program. If you then save the program, the next time you load it in it grows by anoth-

er 16 bytes, and so on.

Now believe it or else, these additional 16 bytes were put in deliberately. It seems that there is a minor, undocumented bug in the Atari S: (graphics screen) driver. Under some circumstances, it will use a few bytes below MEMHI (contents of locations \$2E5-\$2E6, 741-742 decimal). So, if you have a program which extends right to the very top of memory, you can wipe out a little bit of the runtime stack where GOSUBs and FORs are remembered. Somebody at the old Atari apparently had the bright idea that if BASIC told you that memory was full when your program got within 16 bytes of MEMHI, the screen/BA-SIC conflict could be avoided.

A Fix Gone Sour

Pretty good idea. Except for a few problems. First, BASIC doesn't save the string/array space of the runtime stack; both are created when a program is run. So the nice fact that the saved file is guaranteed to have 16 bytes of space left is negated as soon as you DIMension a string or an array or use a GOSUB or FOR. Second, the 16 bytes are added to all of BASIC's size pointers before the comparison with MEMHI is made. Good. But the newly increased value is then stored as the new pointer value. That effectively moves the

program upward in memory by 16 bytes, meaning that the desired 16 bytes of free space aren't there

anyway!

Well, the point of this digression is twofold: (1) This is yet another reason to use LIST and ENTER with rev B BASIC, since ENTERing a program does not trigger this silly 16-byte bug. (2) Several people wrote and suggested that this 16-byte bug is what causes the infamous keyboard lockup bug. Sorry, folks.

Last month, I mentioned the detailed explanation of the rev A Atari BASIC lockup bug which is to be found in COMPUTE!'s Atari BASIC Source Book. Well, apparently somebody at Atari read the book. Or maybe they just noticed that my company had fixed the lockup bug in one of the three or four revised versions of BASIC that we did for Atari back in 1979 (yes, that's 1979). It turns out that the lockup resulted from two missing instructions (and a total of two bytes) within the routine which "contracts" memory. (We say "contracts" because it is used when you delete a program line, so the program is contracted in size.)

Then that same somebody looked at the "expand" routine and saw almost identical code. "Aha!" they say, "Methinks there is a bug here which just hasn't been discov-

ered yet!"

If It Ain't Broken . . .

But they were wrong. The reason the bug appeared in the contract routine is because that routine was written after the expand routine and copied its pattern too closely. So our unknown someone at Atari blindly added code to the healthy expand routine and introduced a very nasty new bug. In fact, because this bug appears when you add lines to an existing program, it is probably more likely to occur than the original rev A bug!

To see a demonstration of the bug, enter the following statements in direct mode (without line numbers):

DIM A\$(249)
A\$="ANY STRING YOU LIKE"
PRINT A\$
PRINT A\$,
PRINT A\$,

The last two statements won't print A\$ properly in either rev A or rev B Atari BASIC—in fact, they'll mess it up two different ways. Cute, eh? The problem is that tacking that comma on the end of the PRINT statement moves the string/array space (and thus A\$) by one byte. Except it doesn't, really, so the variable value table address of A\$ points to the wrong place in memory! Imagine your program being destroyed in a similar way. Is it any wonder you experience keyboard lockup and scrambled listings?

What former Atari employee did I bribe to get all this information about the bugs in rev B BASIC? Did I get the listing on a microdot hidden in a pack of blank disks? Sorry to disappoint you, but I did what any other hacker would do: I dragged out my trusty machine language debugger and carefully disassembled certain portions of rev B BASIC.

Finally, here's how the two bugs we have discussed were fixed in rev C BASIC, which is built into the new XE series computers (and also is available for older Ataris on cartridge at nominal cost—see last month's column). Since both bugs were caused by adding things to code which worked before, you would think that Atari could simply take the "fixes" back out. Nope. Instead, they patched over the extraneous instructions with what are effectively NOP (NO oPeration) instructions. Tacky? Well, I've certainly done it to DOS here in this column enough times, so who am J

PROGRAMMING THE TI

C. Regena

Multiple Choice Test

I've seen a number of computer programs written for multiple choice tests. The computer is an ideal way to administer such tests because it can mix up the test questions so each run is different. However, all the programs I have seen always print the choices in the same order. This month's program is a general-purpose multiple choice tester that randomly arranges both the questions (without repetition) and the possible answers.

This program can be used for questions on any topic. Computer literacy questions are included here

for an example.

The questions and answers are in DATA statements. Each DATA statement contains six items. The first item is the question; the next four are the possible answers; and the last item is the number of the correct answer. The final DATA statement signals the end of the question list:

1350 DATA ZZZ,Z,Z,Z,Z,O

You may use any number of possible questions that will fit in the computer's memory. Line 190 is a DIMension statement that allows for 30 possible questions. To increase the number of questions, change all the 30s in line 190.

Reading The Data

Line 160 defines the number of questions in the test, and line 300 performs the procedure for the specified number of questions. If you want to alter this number, change the 20 in these two lines plus the printed score in line 690. Also make sure you have as many or more questions and answers in the DATA statements as you want in the test.

The variable I is used as a counter for the questions. Questions read from the DATA statements are

stored in the string variable T\$, the four possible answers are stored in A\$, and the number of the correct answer is stored in B. These values are in arrays to keep the answers with the corresponding questions.

As the information is being read in, S\$(I) is set equal to A for use as a signal so questions won't be repeated during the quiz. When a question X is printed, S\$(X) is set equal to "" (null). Line 320 chooses a random number X, but if S\$(X) is null, the question has previously been used and a different X must be chosen. Line 350 prints the question.

Lines 370–390 define C(J) for the four answers to mix up the order in which the answers are printed. Line 400 randomly chooses D for the correct answer. The C variable for the correct answer is set to zero so it cannot be used in another position. Lines 430–490 mix up the order of the answers, making sure the correct answer is in the right position and each answer is used only once. Lines 500–530 print the four answers with the possible choices A, B, C, and D.

Lines 540–580 receive the student's answer, making sure it is a letter from A to D, and then print the choice. Line 590 checks to see if the key pressed is the correct choice. Line 600 prints the message for an incorrect answer, then prints the correct answer. Line 620 prints CORRECT for a correct answer, and line 630 increments the score, SC. Lines 640–670 wait for the student to press ENTER before going to the next question.

Lines 680-700 clear the screen,

then print the score.

To customize the test, simply change the questions and answers in the DATA statements, making sure you have enough questions for a complete quiz and that the last

DATA statement contains ZZZ to signal the end. You might also prefer a fancier title screen.

Here is an example of changing the DATA statements. Suppose your question is "In which year did Columbus discover America?" with the possible answers 1256, 1492, 1776, and 1812. The correct answer is in the second position. The DATA statement would look like this:

720 DATA IN WHICH YEAR DID COLUMBUS DISCOVER AMERICA? 730 DATA 1256,1492,1776,1812,2

If you want to save typing effort, you can obtain a copy of this program by sending a cassette or disk, a stamped, self-addressed mailer, and \$3 to:

C. Regena P.O. Box 1502 Cedar City, UT 84720

Please be sure to specify the name of the program and that you need the TI version.

Multiple Choice Test

100 REM MULTIPLE CHOICE TE ST(5 SPACES) 110 CALL CLEAR 120 PRINT "*********** ********* 130 PRINT "* MULTIPLE CHOI CE TEST #" 140 PRINT "############## ******** 150 PRINT ::::: 160 PRINT "TEST OF 20 QUEST IONS" 170 PRINT :: "PRESS LETTER O F CORRECT" 180 PRINT : "ANSWER FOR EACH QUESTION." 190 DIM T\$ (30), A\$ (30,4), B(3 Ø),S\$(3Ø),AA\$(4) 200 I=1 210 READ T\$(I), A\$(I,1), A\$(I ,2),A\$(I,3),A\$(I,4),B(I 22Ø IF T\$(I)="ZZZ" THEN 26Ø 23Ø S\$(I)="A" 24Ø I=I+1 250 GOTO 210 260 I=I-1 270 PRINT :: "PRESS (ENTER) TO START."

28Ø CALL KEY(Ø,K,S) 29Ø IF K<>13 THEN 28Ø 300 FOR P=1 TO 20 31Ø RANDOMIZE 32Ø X=INT(I*RND)+1 33Ø IF S\$(X)="" THEN 32Ø 340 CALL CLEAR 35Ø PRINT T\$(X):: S\$ (X) = "" 360 37Ø FOR J=1 TO 4 380 C(J)=1 39Ø NEXT J 400 D=INT (4*RND)+1 AA\$(D) = A\$(X, B(X)) 410 42Ø C(B(X))=Ø 43Ø FOR J=1 TO 4 44Ø IF J=D THEN 49Ø 45Ø E=INT (4#RND) +1 46Ø IF C(E)=Ø THEN 45Ø 47Ø AA\$(J)=A\$(X,E) 48Ø C(E)=Ø 49Ø NEXT J 500 FOR J=1 TO 4 51Ø PRINT CHR\$ (64+J); ". "; A A\$ (J) 52Ø NEXT J 53Ø PRINT :: 540 CALL SOUND (100, 1497, 2) 55Ø CALL KEY (Ø, K, S) 56Ø IF (K(65)+(K)68) THEN 55 05 570 CALL HCHAR (23, 3, K) 58Ø PRINT 590 IF K=64+D THEN 620 600 PRINT "NO, THE ANSWER I S "; CHR\$ (64+D); "." 610 GOTO 640 620 PRINT "CORRECT" 63Ø SC=SC+1 64Ø PRINT : "PRESS (ENTER)." 650 CALL KEY (Ø, K, S) 660 IF K<>13 THEN 650 670 NEXT P 680 CALL CLEAR 690 PRINT "OUT OF 20 QUESTI ONS." PRINT "YOUR SCORE IS "; SC:::: 71Ø GOTO 136Ø 720 DATA ONE OF THE MAJOR A TTRACTIONSOF A COMPUTER

IS THAT IT 730 DATA HAS ACTIVE INVOLVE

MENT., IS EXPENSIVE., IS A STATUS SYMBOL. 740 DATA ALLOWS UNINVOLVEME

NT.,1

750 DATA A VIDEO GAME IS BE ST(B SPACES) DESCRIBED A S A(N)

760 DATA EXPENSIVE TOY., SPE CIAL PURPOSE COMPUTER. HOME COMPUTER., EDUCATIO NAL TOY., 2

770 DATA THE COMPUTER OWES ITS(7 SPACES)FLEXIBILIT Y TO THE FACT THATIT IS

780 DATA SMALL., COMPLICATED . , PROGRAMMABLE. , AN ELEC TRONIC DEVICE., 3

790 DATA "BECAUSE A COMPUTE R IS(7 SPACES) PROGRAMMA BLE,"

800 DATA IT CAN BE USED TO PERFORM (3 SPACES) ONLY A LIMITED NUMBER OF (4 SPACES) FUNCTIONS.

810 DATA IT CANNOT BE USED FOR (7 SPACES) EDUCATIONA I PURPOSES.

820 DATA IT CANNOT BE USED FOR (7 SPACES) ENTERTAINM ENT.

830 DATA IT CAN BECOME A GE NERAL (5 SPACES) PURPOSE TOOL., 4

840 DATA THE MAIN ADVANTAGE OF A(5 SPACES) COMPUTER AS OPPOSED TO (6 SPACES) OTHER CALCULA TING DEVICES (3 SPACES) I S ITS

85Ø DATA COST., SIZE., PORTAB ILITY., PROGRAMMABLE NAT URE.,4 860 DATA BOOKS AND MANUALS

THAT (6 SPACES) ACCOMPANY A COMPUTER-RELATEDPROD UCT ARE

870 DATA SOFTWARE., DOCUMENT ATION., DATA., COMPU-FORM 5.,2

880 DATA VISICALC IS BEST D ESCRIBED AS A(N)

890 DATA TUTORIAL PROGRAM., ELECTRONIC SPREADSHEET.

900 DATA EDUCATIONAL PROGRA M., ENTERTAINMENT PROGRA

910 DATA ALL OF THE FOLLOWI NG ARE(4 SPACES) PROGRAM MING LANGUAGES EXCEPT

920 DATA BASIC., PASCAL., VIS ICALC., LOGO., 3

930 DATA ONE OF THE MAJOR P ROBLEMS INACQUIRING COM PUTER LITERACY IS

940 DATA PEOPLE NEED TO BE SKILLED (3 SPACES) IN MAT HEMATICS TO USE (7 SPACES) COMPUTERS.

950 DATA THE COMPUTER IS A VERY(6 SPACES) COMPLICAT ED MACHINE.

DATA THE FIELD HAS ITS OWN(7 SPACES)LEXICON OR LANGUAGE.

970 DATA PEOPLE NEED A BACK GROUND (4 SPACES) IN LOGI C AND STATISTICS.,3

98Ø DATA THE PARTS OF A COM PUTER ARE ARRANGED IN S UCH A WAY AS TOFORM A(N

990 DATA SYSTEM., MACHINE., S UBSYSTEM., ORGANIZATION.

1000 DATA THE PROCESSING OF DATA IN A COMPUTER SY STEM RESULTS IN THE G ENERATION OF

1010 DATA A PROGRAM., READOU TS., INFORMATION., STATI STICS.,3

1020 DATA "BASICALLY, A COM PUTER IS(4 SPACES) INTE NDED TO PRODUCE"

1030 DATA INFORMATION., DATA ., STATISTICS., PROGRAMS

1040 DATA THE BASIC FUNCTIO N OF A(5 SPACES) COMPUT ER IS TO TRANSFORM

1050 DATA PROGRAMS INTO DAT

1060 DATA DATA INTO PROGRAM

1070 DATA INFORMATION INTO DATA.

1080 DATA DATA INTO INFORMA TION.,4 1090 DATA "BY USING A ----

ONE MAY CONNECT A COMPUTER TO THE (3 SPACES) TELEPHONE TO PERMIT COMPUTERCONFER ENCING."

1100 DATA ADAPTER, CONNECTOR , CONFERENCE LINK, MODEM

1110 DATA INTANGIBILITY IS A MAJOR (4 SPACES) CHARA CTERISTIC OF

1120 DATA SOFTWARE., THE COM PUTER., HARDWARE., MAGNE

TIC DISKS.,1 1130 DATA THE USE TO WHICH A COMPUTER IS PUT IS C ALLED A(N)

1140 DATA PROGRAM., ROUTINE. , APPLICATION. , FUNCTION ,3

1150 DATA INSIDE THE COMPUT ER (9 SPACES) INFORMATIO N IS REPRESENTED BY

1160 DATA PUNCHED CARDS., EL ECTRONIC SIGNALS., MAGN ETIC TAPE., MAGNETIC DI

SKS.,2 1170 DATA THE ON/OFF PATTER N THAT IS USED IN THE COMPUTER IS THE BASIS OF THE

1180 DATA CIRCUIT CODE., BIN ARY CODE., BINOMIAL COD E., BIDECIMAL CODE., 2

1190 DATA "WITH TELECOMMUTI NG, (9 SPACES) INFORMATI ON IS MOST COMMONLYTRA NSMITTED BETWEEN (9 SPACES) TERMINALS"

1200 DATA BY RADIO., OVER TE LEPHONE WIRES.

1210 DATA VIA SATELLITE., BY TELEVISION., 2

1220 DATA A COMPUTER PROGRA M IS AN(4 SPACES) EXAMP LE OF

1230 DATA HARDWARE., SOFTWAR E., FIRMWARE., FLEXWARE.

1240 DATA THE FIRST ELECTRO NIC(8 SPACES) COMPUTER WAS

1250 DATA ENIAC., ENID., IBM MARK I., IBM CYBERNAUGH

1260 DATA THE COMPUTER IS I NSTRUCTED OR TOLD WHA T TO DO BY

1270 DATA HARDWARE., FIRMWAR E., SOFTWARE., SMARTWARE .,3

1280 DATA THE MOST SIGNIFIC ANT FACTOR IN PURCHASI NG A COMPUTER IS

1290 DATA RELATIVE COST., AV AILABLE SOFTWARE., AVAI LABLE HARDWARE., AVAILA BLE FIRMWARE., 2

1300 DATA WHICH IS THE MOST COMMON (4 SPACES) TYPE OF SECONDARY STORAGE (3 SPACES) CURRENTLY US ED IN PERSONAL COMPUT ERS?

1310 DATA FLOPPY DISKS, BUBB LE MEMORY, ELECTRIC CON DUCTORS, TUNNEL JUNCTIO N MEMORY, 1

1320 DATA RAM IS USED AS A MEASURE OF

1330 DATA PRIMARY STORAGE C APACITY., PROCESSING PO WFR.

1340 DATA PROCESSING SPEED. , WORD LENGTH., 1

1350 DATA ZZZ, Z, Z, Z, Z, Ø 1360 END

Housepainter Inverted Video On The Commodore 64

Jim Butterfield, Associate Editor

By fooling the eye with reverse characters, you can make a single-colored object appear to pass over a multicolored background—without sprites or machine language. The technique can also be adapted to the VIC-20, Plus/4, and 16.

If you've ever played around with video effects on the Commodore 64, you know that ordinary video involves one background color and a choice of printing colors. In other words, you can print green, red, and yellow on a white background, but you can't go the other way and print, say, white on a multicolored background. However, you can use an easy trick to get the same effect.

Here's the objective: Assume you want to move an object over a multicolored background. Maybe it's a small black bug flying over terrain which is green (grass), blue (water), and white (ice). You don't want the bug to change color as it passes these areas; it must stay black. Yet the 64 seems to be set up to work the opposite way. The foreground color may change from one character cell to another, but the background must be one solid color across the whole screen.

There are many special features you could use to get around this problem, of course. Extended color mode allows you a choice of backgrounds; it's attractive for many uses and too little used by most programmers. Sprites may be placed anywhere on the screen over existing character patterns, giving a color-over-color effect. You could even use a split-screen technique to create multiple backgrounds.

But you can also achieve the

effect without resorting to special features. To invert the screen effects, we must invert our thinking.

Holes In The Sky

When I was a small child, I used to think that stars were tiny holes in a black curtain that covered the night sky. In other words, they were points of light shining through. I couldn't tell the difference between a white light source set against a black background and a white background shining through gaps in a black foreground.

That's the technique we'll use here. Since the 64 has one background color and a choice of many foreground colors, let's flip them over to create one "foreground" color against a mixture of many "background" colors. We'll have to work in reverse characters to switch background and foreground, but that's no hardship.

Let's try a simple example program which moves a white letter A over a multicolored background:

100 PRINT CHR\$(144); CHR\$(147) 110 POKE 53281,1

This clears the screen (147) and sets the colors—background to white (53281) and cursor to black (144).

120 FOR J=0 TO 39 130 POKE 1024+J,160 140 POKE 55296+J,RND(1)*14+2

This POKEs reverse spaces (160) into the top line of screen memory, and puts random colors into color memory beginning at 55296. Note that we need *reverse* space characters. Ordinary spaces would show the background color only, but the reversed ones show the random foreground colors. These colors will

seem to be background, because they won't change.

160 FOR J=0 TO 38 170 POKE 1024+J,160 180 POKE 1025+J,129 190 FOR K=1 TO 100 200 NEXT K,J

These final lines move the white letter A from left to right across the top of the screen. The screen code for A is a value of 1, but the program adds 128 to get a value of 129 for a reverse A. As the A moves to its new position, it is erased from its old spot by POKEing a reverse space there (160).

An Optical Illusion

We know the program moves a reverse A along the top line of the screen. And we know that each character is a different, random, color as we print it. But when we enter RUN and watch the program work, we see a white A moving across the top. Why? Because we're really seeing the white background color "peeking through" the reversed foreground. The optical illusion is complete: A single foreground color seems to be moving across a multicolored background.

Let's use this principle in a short program called "House-painter." It's part game, part puzzle, and part coordination exercise. You have five minutes to paint the house, using the four special function keys to move the brush. You are not allowed to paint over any area twice, so be careful and plan your work. By the way, it is possible to succeed, although you may have a lot of trouble at first.

The program is entirely in BASIC, which accounts for the delay

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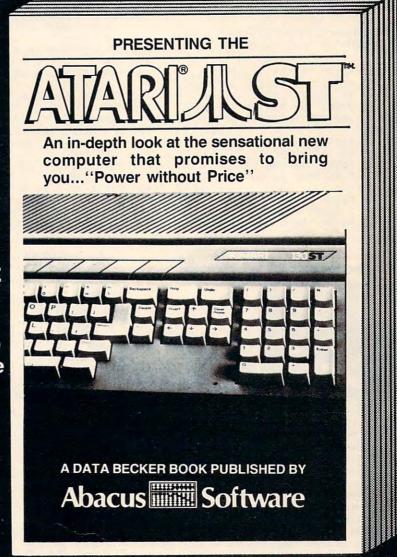
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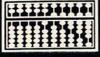
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as it sets up the screen. The house is drawn with several rectangles defined in DATA statements. Note that the characters showing the time in the upper left of the screen seem normal, but are really in reverse video. The white is the background color peeking through. Similarly, the white paint itself and the circular brush are really background colors. That's how the white brush can move inside a red shed and across a yellow house: It's inverted video.

Housepainter

Please refer to "COMPUTE!'s Guide to Typing in Programs" before entering this listing.

100 PRINT "{CLR}{DOWN}HOUSEPAI NTER{2 SPACES}-{2 SPACES}J IM BUTTERFIELD" :rem 228 110 PRINT "{3 SPACES}TRY TO PA INT THE HOUSE USING THE :rem 43

120 PRINT "FUNCTION KEYS TO MO VE THE BRUSH. :rem 81
130 PRINT "{3 SPACES}YOU'RE NO T ALLOWED TO PAINT OVER :rem 82

140 PRINT "AN AREA SO DON' T PAINT YOURSELF :rem 105 150 PRINT "INTO A CORNER.

160	PRINT "{3 SPACES}YOU HAVE	430	NEXT J :rem 32
	[SPACE] FIVE MINUTES.	440	TIS="000000" :rem 250
	[2 SPACES] LEAVE THE: rem 50	450	NEXT J :rem 32 TI\$="000000" :rem 250 V=19:H=32 :rem 186
170	PRINT "PAINT BRUSH IN THE	460	POKE VØ*4Ø+HØ+SØ,16Ø
	[SPACE] RED SHED WHEN		:rem 241
	:rem 240	470	POKE V*40+H+S0, 209: rem 150
180	PRINT "YOU'RE FINISHED.	480	VØ=V:HØ=H :rem 236
	{2 SPACES}PRESS ANY KEY TO	490	PRINT CHR\$(19); CHR\$(18); TI
	GO. :rem 64		\$:rem 216
190	FOR J=1 TO 1E4:GET X\$:IF X	500	IF TI\$>"ØØØ499" GOTO 68Ø
	\$="" THEN NEXT J :rem 154		:rem 116
	DATA 3,0,24,0,39 :rem 193		K=PEEK(203) :rem 41
	DATA 7,10,20,10,30 :rem 27	520	GET K\$:K1=ASC(K\$+CHR\$(Ø))
	DATA 7,8,9,15,18 :rem 213		:rem 29
	DATA 3,15,17,13,15 : rem 42	530	IF K1=133 THEN V1=-1
	DATA 3,16,18,25,27 :rem 51		:rem 200
	DATA 3,17,20,19,21 :rem 43	540	IF K1=134 THEN H1=-1
	DATA 2,18,20,31,33 :rem 41		:rem 188
	DATA -1 :rem 17	550	IF K1=135 THEN H1=1
300	PRINT CHR\$(159); CHR\$(147);	560	:rem 145
	"WAIT"; CHR\$(142); CHR\$(8):P	560	IF K1=136 THEN V1=1
210	OKE 53281,1 :rem 160 CØ=55296:SØ=1024 :rem 16	E70	:rem 161 IF K<64 GOTO 590 :rem 243
	REM :rem 121 READ C:IF C<Ø GOTO 400	500	V1=0:H1=0 :rem 177 V=V0+V1:H=H0+H1 :rem 68
330	:rem 58	600	P=CØ+V*4Ø+H:IF P=P9 GOTO 4
340	READ V1, V2, H1, H2 : rem 57		
350	FOR J=V1*40 TO V2*40 STEP	610	9Ø :rem 2Ø5 C=PEEK(P)AND15 :rem 22
555	[SPACE] 40 : rem 116	620	IF C<>7 AND C<>2 GOTO 490
360	FOR X=CØ+J+H1 TO CØ+J+H2	020	:rem 179
	:rem 209	630	IF C9=7 THEN POKE P9,1:N=N
370	POKE X,C :rem 144 NEXT X,J :rem 168 GOTO 330 :rem 107		-1 :rem 205
380	NEXT X,J :rem 168	640	-1 :rem 205 P9=P:C9=C :rem 230
390	GOTO 330 :rem 107	65Ø	IF C<>2 OR N>Ø GOTO 46Ø
400	FOR J=SØ+4 TO SØ+999:POKE		:rem 73
	[SPACE]J,160:NEXT J:rem 25	660	PRINT " WINNER! " :rem 97
	FOR J=CØ TO CØ+999 :rem 98		
420	IF (PEEK(J)AND15)=7 THEN N	680	PRINT " YOU MISSED"; STR\$(N
	=N+1 :rem 71);" SQUARES" : rem 203 0
			•



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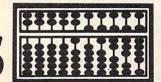
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Software

BASIC File Editor For Commodore

Henry A. Doenlen

Edit ASCII files in the form of numbered BASIC lines with this short utility for the Commodore 64 and VIC-20.

One of the best features of any Commodore computer is its BASIC line editor. By using the insert, delete, and cursor control keys, you can easily move the cursor anywhere on the screen and edit a BASIC program without having to retype entire lines.

Unfortunately, ASCII data files—files of characters such as those produced by many word processor or database management programs—are not so easy to edit. To change one data item in a file, you must either rerun the program that produced the file, or write another program that reads the file, makes the change you want, and writes the file back to disk or tape. Both options are time-consuming.

Disguising ASCII As BASIC

Although the Commodore BASIC editor is not designed to edit such files, you can make it do the job with a simple trick: Disguise the ASCII data as a collection of BASIC lines by adding line numbers and quotation marks. For example, enter this line:

10 "I'M REALLY ASCII DATA"

You can't execute this line in a program, of course, without getting an error. But the BASIC editor can handle it with ease, letting you add or delete characters, change the line number, or relist the line. "BASIC File Editor" uses this trick to let you edit ASCII files, adding artificial line numbers and quotation marks when it loads a file into memory, and deleting them when the file is resaved.

Type in BASIC File Editor and save it. If you are using a Commodore 64 or VIC-20 with a disk drive, enter the program exactly as it is listed. Tape users should omit lines

5, 220, and 360–387, change the 42 in line 350 to 35, and change the following lines as shown:

110 PRINT"{DOWN}LOAD FILE":INP UTF\$:rem 232 120 CLOSE1:OPEN1,1,0,F\$:rem 38 230 CLOSE1:OPEN1,1,1,F\$:rem 41

Before editing an important file, you may want to practice on a test file. This five-line program makes a test file for you (tape users should change the 8 in line 10 to a 1):

- 10 OPEN1,8,1,"00:ASCTEST,P,W"
 20 PRINT#1,"THIS PROGRAM MAKES
- 30 PRINT#1, "ASCII DATA LOOK"
 40 PRINT#1, "LIKE BASIC LINES."
 50 CLOSE1

After making the test file, load and run BASIC File Editor. The menu offers four options: You can press L to load a file, S to save a file, C to clear data from memory, or E to list your data and exit the program. To load the test file, press L, then type ASCTEST when prompted for the filename. (Disk users should then enter P to indicate that ASCTEST is stored as a program file, as indicated by the ,P in line 10.) After the main menu reappears, press E to list the data and return to immediate mode.

Editing Your Data

As you can see, the ASCTEST data is spliced onto the end of BASIC File Editor in the form of numbered program lines. The data lines can be edited like any other BASIC lines. Try making some changes. To add new data at the end of the file, enter new lines with higher line numbers. Use intermediate line numbers to insert new data between existing lines. Don't forget that the data in each line must be enclosed in quotation marks.

When you're done editing, enter RUN to reenter the File Editor program and press S to resave the file. Again you'll be prompted to enter a filename. If you are using a disk drive, do not use the same filename (ASCTEST) unless you want the revised file to replace the original file. If you use a different filename, a new file is created. Of course, if you are using tape you must also be careful to rewind the cassette if you want the old file erased, or be careful not to overwrite the old copy if you want it preserved.

Now press C to clear the data area, and L to load your new file. After it loads, press E to verify that the changes were successful. If you had not pressed C, the new file would have been appended to the data already in memory. This makes it easy to append one file to another.

You should avoid using RUN/STOP or RUN/STOP-RESTORE to break out of the program. Always exit by pressing E at the menu, or important memory pointers will be left scrambled. If you do break out, rerun the program, then do a load followed by a clear before attempting any further editing.

When A Program Isn't A Program

For tape users, there's only one simple way to store ASCII data: as a tape data file. Hence, the tape version of the File Editor program works only with such files. However, disk users have greater flexibility in choosing a file type.

The most common format for character data storage on disk is the sequential file. Such files are easy to create: Simply OPEN 1,8,1,"filename, S,W" (the final ,S,W indicates that the file called *filename* is to be a Sequential file open for Writing). Then use PRINT#1 to write the desired data to the file and CLOSE 1 when finished. Such files will show up in the disk directory as SEQ. However, it's also possible to store the data in a program file. The pro-

cedure is the same as for sequential files, except that the S,W in the OPEN statement is changed to ,P,W (where the P indicates a program file). Otherwise, you still use PRINT# to write data to the file, as illustrated in the ASCTEST file created in the example above. There are several advantages to storing data in program file format. For example, with careful planning the program file of ASCII data can be retrieved with LOAD, which is significantly faster than using GET# or INPUT#. You may only rarely encounter ASCII data stored in program files, but the File Editor program can handle it in case you do.

Although BASIC File Editor allows you to edit ASCII data stored in program files, it does not allow you to edit BASIC programs stored in program files. While the file type is the same, all the BASIC keywords in a program are represented in the disk program file as single characters called tokens, which appear as reverse-video characters. Moreover, changes which affect the length of any program lines will cause the edited program to crash when loaded and run. Also, the File Editor can only be used to edit ASCII data files, which means it is not directly compatible with some database and word processing programs—including COMPUTE!'s SpeedScript word processor-which store characters as their Commodore screen code values rather than as ASCII values. (SpeedScript does allow you to print an ASCII file to disk, which could then be edited.)

It is possible to use the File Editor to load ASCII data from program files and store it into sequential files, and vice versa. However, in this case the replace feature will not function properly. That is, you cannot use the same filename for the edited file if you are storing it as a different type from the original.

Customizing The Editor

BASIC File Editor works best with ordinary alphanumeric data (letters and numbers), such as you might find in a word processing file. Carriage return characters (CHR\$(13)) are interpreted as separators. When BASIC File Editor finds a carriage return while loading the file, it terminates the current data line and

begins a new one.

It should not be difficult to customize this program for your own particular needs. Before doing so, however, look at line 350. The FORNEXT statement sets up a loop that counts through the lines of the program (42 for disk or 35 for tape). If you add or delete any lines in the File Editor program, you'll need to change this value from 35 or 42 to whatever is appropriate.

BASIC File Editor

Please refer to "COMPUTEI's Guide to Typing In Programs" before entering this listing.

5 (PEN15	8.15		:rem	195
		"{CLR}{3			
		EDITOR {			
20	PRINT	" {HOME } {	2 DOW	N } SEL	ECT
	OPTIC	ON:"		:rem	59
20	DDTM	" T-TOAT	DITTE	II . DDT	ATITE II

30 PRINT " L=LOAD FILE":PRINT" S=SAVE FILE":PRINT" C=CLEA R":PRINT" E=EXIT/LIST"

	:rem ll
40	GETA\$:IFA\$=""THEN40:rem 235
	IFA\$="E"THENCLOSE15:LIST390
	-:END :rem 122
6Ø	FORC=1TO3:IFA\$=MID\$("LSC",C
	,1) THENONCGOSUB80,210,300:G
	OTO10 :rem 201
70	NEXTC:GOTO20 :rem 190
80	POKE45, PEEK (55): POKE46, PEEK

(56)-1:GOSUB340:L=PEEK(44)*
256+PEEK(43) :rem 11
90 IFPEEK(L)+PEEK(L+1)=0THEN11

0 :rem 49
100 N=PEEK(L+3)*256+PEEK(L+2):
 L=PEEK(L+1)*256+PEEK(L):GO
 TO90 :rem 190

110 PRINT"{DOWN}LOAD FILE":INP
UTF\$:PRINT"{DOWN}PROGRAM O
R SEQUENTIAL{2 SPACES}(P/S
)":INPUTT\$:rem 29
120 CLOSEL:OPENI 8 2 EST" "+TS

120 CLOSE1:OPEN1,8,2,F\$+","+T\$
+",R":GOSUB360:IFFL=1THEN1
0 :rem 6

130 A=L:T=PEEK(46)*256+PEEK(45

)-10 :rem 104 140 L=A:A=A+3:N=N+10:POKEA,N/2 56:POKEA-1,N-PEEK(A)*256:A

=A+1:POKE A,34 :rem 4 150 A=A+1:GET#1,C\$:D=ASC(C\$+CH R\$(0)):IF D<>13ANDA<TTHENP OKEA,D:GOTO150 :rem 80

160 POKEA, 34:POKEA+1, 0:A=A+2:P OKEL+1, A/256:POKEL, A-PEEK(L+1)*256 :rem 208

170 IFST=ØANDA<TTHEN140 :rem 163

180 IFA>=TTHENPRINT"OUT OF MEM ORY" :rem 158 190 POKEA,0:POKEA+1,0:A=A+2:PO

190 POKEA,0:POKEA+1,0:A=A+2:PO KE4,A/256:POKE 3,A-PEEK(4) *256 :rem 155 200 GOSUB330:CLOSE 1:RETURN

:rem 163
210 GOSUB350:PRINT"[DOWN]SAVE

(SPACE)FILE":INPUTF\$
:rem 74
220 PRINT"(DOWN)PROGRAM OR SEQ

UENTIAL {2 SPACES} (P/S)":IN
PUTT\$:rem 143
230 CLOSE1:OPEN1,8,2,"@0:"+F\$+
","+T\$+",W":GOSUB360:IFFL=
1THEN10 :rem 38

40	IFPEEK(A)+PEEK(A	A+1)=ØTH	IENC	
	LOSE1:RETURN	:rem	119	
5Ø	A=A+3	:rem	180	

260 A=A+1:IFPEEK(A)=0THENPRINT #1,"":A=A+1:GOTO240

:rem 126 270 IFPEEK(A)<>34THEN260

:rem 135 28Ø A=A+1:IFPEEK(A)=34THEN26Ø

:rem 160 290 PRINT#1,CHR\$(PEEK(A));:GOT

028Ø :rem 249 3ØØ PRINT"CLEAR":GOSUB35Ø:POKE A,Ø:POKEA+1,Ø:A=A+2

:rem 219 310 POKE4,A/256:POKE3,A-PEEK(4)*256 :rem 215

320 GOSUB330:RETURN :rem 197 330 POKE46, PEEK(4):POKE45, PEEK

(3) :rem 172 34Ø POKE47,PEEK(45):POKE48,PEE K(46):POKE49,PEEK(45):POKE

50, PEEK(46): RETURN: rem 242 350 A=PEEK(44)*256+PEEK(43): FO RN=1TO42: A=PEEK(A+1)*256+P

EEK(A):NEXTN:RETURN
:rem 254
360 PRINT:POKE198,0:INPUT#15,A

\$,B\$,C\$,D\$:rem 42 370 IFB\$="OK"THENFL=0:RETURN

380 PRINTA\$" "B\$" "C\$" "D\$" ":
FL=1:PRINT" DOWN HIT ANY K
EY":A\$="" :rem 254

385 GETA\$:IFA\$=""THEN385 :rem 99

387 RETURN :rem 130 390 REM===== FILE FOLLOWS === ===== :rem 150 ©

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Page Flipping On The Atari

Clay Stuart

Page flipping is an animation technique in which entire screens can be flashed in rapid sequence, much like flipping through the pages of a book. This makes possible some amazing graphics displays. The article includes two demonstration programs (one for computers with as little as 16K RAM, and another for machines with at least 48K). The programs work on the 400/800, XL, and XE models.

Animation is any sequence of events that creates the illusion of motion. Note the phrase *illusion of motion*: no actual motion is required. For example, consider the lights on a movie marquee, stadium scoreboard, or message board. When the lights are flashed in sequence, they produce the illusion of motion, although the bulbs themselves are stationary.

Movies and cartoons work on the same principle. They consist of a series of still pictures, each slightly different than the one before it. When the pictures are projected in rapid succession, we perceive motion. The same principle can be applied to computers, except that few computers can draw high-resolution screens fast enough to fool the eye. The answer is a special programming technique known as screen flipping or page flipping. Screens are drawn beforehand and stored in memory, then displayed one after the other in an instant.

ANTIC And Display Lists

By now, many of you are well acquainted with the Atari ANTIC chip, display lists, and how Atari computers display screen images. Many articles and books have been published on this subject. However, a quick overview will be helpful here.

Besides the 6502 microprocessor, the Atari also contains a special chip known as ANTIC. ANTIC is a true microprocessor with its own in-

struction set, and it is in charge of displaying all screen data. The program that instructs ANTIC is called a display list. The display list is merely a list of instructions that locates screen memory for ANTIC and tells it which graphics mode to display. The starting address of the display list is stored in the customary low byte/high byte form at memory locations 560 and 561. To find the starting address of the display list in any graphics mode, type the following line in immediate mode:

GR.[mode]:DL=PEEK (560)+256*PEEK(561):PRINT DL

where [mode] is the graphics mode number. This line can also be included in a program to store the display list address in the variable DL.

Screen Memory And Pointers

While display lists differ greatly, depending on the graphics mode, one thing is always certain. The fifth and sixth bytes of the display list contain the low and high bytes of the starting address of screen memory. To find the starting address of screen memory in any graphics mode, use this line:

GR.[mode]:DL=PEEK (560)+256*PEEK(561):ST=PEEK (DL+4)+256*PEEK(DL+5):PRINT ST

Remember that when indexing within a list, you start counting at zero. That's why the fifth element of the display list is calculated at DL+4 and the sixth at DL+5. These two bytes together are called a pointer. As ANTIC scans the display list, these two bytes point ANTIC to the start of the screen memory.

The use of pointers is called *indirection*. Indirection can be a very powerful tool, and thanks to the foresight of Atari's engineers, it makes page flipping possible on Atari computers. Some other computers reserve an area of memory that is dedicated entirely to the video display. To display a new screen-

ful of data, the entire screen must be redrawn. This requires the high speeds of machine language, and at best is a complicated and time-consuming project. Through the use of pointers and indirection, the Atari avoids these complications.

By simply POKEing new values into the screen memory pointer in the display list, any area of memory can be instantly displayed on the screen. There is only one important rule to follow. To avoid garbled displays, screen memory should not cross a 4K memory boundary—that is, any address evenly divisible by 4096.

There is a way around this problem, but there's no room to explain it in detail here. However, you should note that it's impossible to flip pages in GRAPHICS 8 without taking this problem into account. Because GRAPHICS 8 uses about 8K of screen memory, the screen always crosses a 4K boundary. For now, it's probably best to experiment with page flipping in graphics modes 0 through 7, which use less than 4K of screen memory. With careful planning, screen memory need never cross a 4K boundary in these modes.

Setting Up Page Flipping

To implement page flipping, you must first calculate the starting address of the area of memory you wish to display. (You'll have to determine how much memory to set aside depending on the number of pages you want to flip, how much RAM is installed in your machine, etc.) Next, convert this number to its low-/high-byte representation using the following line:

AD = [address]:HI = INT(AD/256):LO = AD - (256*HI)

where [address] is the starting memory address.

Then, choose a graphics mode and calculate the starting address of the display list. Finally, POKE the values LO and HI into the screen memory pointers in the display list—LO byte first, HI byte second. Remember, the screen memory pointers are always the fifth and sixth bytes of the display list. Use the following short program as an example:

10 AD=40960 20 HI=INT(AD/256):LO=AD-(256*HI) 30 GRAPHICS Ø 40 DL=PEEK(560)+256*PEEK(561) 50 POKE DL+4,LO:POKE DL+5

When executed, the screen should almost instantly change to display this new area of memory. This area of memory is part of the BASIC ROM, and should be filled with all sorts of interesting data. It will be displayed as characters, since GRAPHICS 0 is a character mode. By substituting different values for the variable AD in the program above, any area of memory can be displayed (as long as it doesn't cross a 4K boundary, remember). Of course, if the area of memory you choose to display is empty, the screen will be blank.

More Pointers

, HI

There are two other memory locations that are important to know when page flipping. These are locations 88 and 89, another pointer. They store a memory address in the usual low-byte/high-byte form, and point to the area of memory where all PRINTs, PLOTs, and DRAWTOs will be directed, except for information displayed in text windows. By POKEing new values into these locations, you can redirect all PRINTs, PLOTs, and DRAWTOs to any area of memory. In other words, rather than printing text or drawing graphics on the screen, you can print text or draw graphics anywhere in memory and then display this page instantly.

This makes it possible to construct a series of pictures, each slightly different than the one before it, and each in a separate area of RAM. By rapidly flipping through these pictures in sequence, a program creates the illusion of motion. That's how the demonstration programs below work.

A Spinning Globe

If you have at least 48K RAM, use Program 1. If you have only 16K RAM, use Program 2 and make sure

no disk drive is connected. Program 1 creates a spinning globe on the high-resolution GRAPHICS 8 screen. Program 2 creates a spinning globe too, but on the medium-resolution GRAPHICS 7 screen to conserve memory. (Program 2 also works on machines with more than 16K as long as the disk drive is disconnected.)

Both programs GOSUB to a routine that READs machine language DATA into page 6 (starting at location 1536 decimal). After RE-TURN, Program 1 fills an array with SIN and COSINE values to speed up the drawing process. Program 2 skips this step due to the limited memory on a 16K machine. Both programs switch to a PLOT mode at line 60 and set up the various color registers at line 70. The starting address of the display list is calculated at line 80, and certain variables are initialized at line 90. (When you run Program 1, the screen is blank for about one minute during these steps.)

Lines 100 through 240 use BASIC trigonometric functions to draw three slightly different views of a wire globe. Each drawing is stored in a separate area of RAM. The spokes of this globe are nine degrees apart, and each drawing shows the globe rotated three degrees from the previous one. As each drawing is completed, the ON-GOSUB statement at line 230 directs the program to one of two subroutines at lines 1000 and 2000. These routines POKE the screen memory pointers into the display list, and POKE the PRINT, PLOT, and DRAWTO pointers with the address of the next area of memory to be displayed.

When all of this is completed, line 250 calls the machine language subroutine in page 6. This sets up a vertical blank interrupt routine that rapidly displays the drawings in sequence. The globe appears to spin!

Multiprocessing?

Although machine language is not really necessary for page flipping, it was included here for a reason. Notice that when the globe starts spinning, the READY prompt appears in the text window at the bottom of the screen. You can type LIST to view the program in the text window while it is executing, or even type

NEW and enter another program without affecting the display. This allows you to incorporate the spinning globe in your own programs.

Another interesting item is memory location 1554. This location in the vertical blank routine controls the speed of the globe's rotation. It normally contains a 1. Try POKEing 1554 with a 3 to slow down the rotation, or a 0 to speed things up.

For an example of page flipping in BASIC, add these lines to Program 1:

LJ 245 POKE DL+5,129:POKE DL +101,144:FOR X=1 TO 1 0:NEXT X

IJ 246 POKE DL+5,97:POKE DL+
101,112:FOR X=1 TO 10
:NEXT X

FJ 247 POKE DL+5,65:POKE DL+
101,80:FOR X=1 TO 10:
NEXT X

HC 248 GOTO 245

or these lines to Program 2:

AJ 245 POKE DL+5,16:FOR X=1 TO 10:NEXT X

Al 246 POKE DL+5, 32: FOR X=1 TO 10: NEXT X

BA 247 POKE DL+5, 48: FOR X=1 TO 10: NEXT X

HC 248 GOTO 245

These modifications bypass the machine language, yet show how BASIC is plenty fast enough for page flipping. You can slow down or speed up the globe by changing the values in the FOR-NEXT loops. Or you can press BREAK and enter GOTO 250 in direct mode to let the machine language routine spin the globe.

Feel free to use these programs for your own pursuits. Remember that once they are running, you can enter NEW and type in your own program. Who knows—maybe you can come up with a game that has a rotating planet in the background. (Incidentally, player/missile graphics is an ideal way to add moving objects when flipping screens, because it's not affected by page flipping.)

Please refer to "COMPUTEI's Guide to Typing In Programs" before entering these listings.

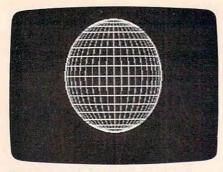
Program 1: Spinning Globe Demo (48K)

EU 5 REM REQUIRES AT LEAST 4
8K
F6 10 POKE 559,0:GOSUB 3000:
DIM ARR(450,1):DEG
6K 19 REM **** ARRAY FILL RO
UTINE ****
DL 20 FOR I=0 TO 450
PP 30 ARR(I,0)=SIN(I)

PH 40 ARR(I,1)=COS(I)

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Www.commodore.ca



Quickly flipping in sequence through four previously drawn screens, Program 1 creates the illusion of a spinning globe in high-resolution graphics.

ON 50 NEXT I REM ** SETUP GRAPHICS AB 59 MODE ** OP 60 GRAPHICS B POKE 710,144: POKE 712, KF 7Ø 144: COLOR 1 DN 79 REM ** CALCULATE START OF DL ** EK 8Ø DL=PEEK (560) +256 *PEEK (561) A0 9Ø XØ=159:YØ=79:RDS=78:Z= REM **** DRAW GLOBE RO

FC 11Ø FOR ANG=ROT TO ROT+18 Ø STEP 9 J0 12Ø R=RDS*ARR(ANG, 1)

IE 13Ø X=XØ+R*ARR(27Ø,1)

EP 100 FOR ROT=6 TO 0 STEP -

IITTNE EXEX



A must for all Atari users. CART CLONE will backup and transfer any 8 or 16K cartridge to disk or tape. The contents of the cartridge will become a file which you can transfer, rename or delete.

They will execute from DOS. No need to run a special menu or program to run these files (requires minimum 48K RAM).

□ Will it copy any cartridge? The answer is YES. ☐ What will I get? The answer is a cartridge containing the hardware and a disk with the cloner software in a powerful machine language program.

CART CLONE Goes in the left cartridge slot enabling it to work in all ATARI Home Computers including the XL series.

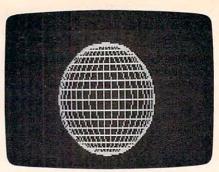
ULTIMA ELECTRONICS, LTD. 21 Central Drive Farmingdale, New York 11735 (516) 752-0144 Toll Free: 800-645-9607 We accept VISA, American Express and C.O.D. orders

BN 140 Y=YØ+RDS*ARR(270,0) LC 15Ø PLOT X, Y FOR CIR=280 TO 450 ST AM 160 EP 1Ø BK 17Ø X=R*ARR(CIR, 1) LC 18Ø Y=RDS*ARR(CIR,Ø) KP 19Ø DRAWTO XØ+X, YØ+Y CH 200 IF ANG=ROT THEN DRAWT O XØ-X, YØ+Y:PLOT XØ+X YØ+Y LA 210 NEXT CIR KJ 220 NEXT ANG LL 230 ON Z GOSUB 1000, 2000 NEXT ROT MK 240 POKE DL+5, 129: POKE DL LJ 245 +1Ø1,144:FOR X=1 TO 1 Ø: NEXT X N 246 POKE DL+5, 97: POKE DL+ 101,112:FOR X=1 TO 10 : NEXT X FJ 247 POKE DL+5,65: POKE DL+ 1Ø1,8Ø:FOR X=1 TO 1Ø: NEXT X HC 248 GOTO 245 LD 250 A=USR (PAGE6) 6P 26Ø END ED 999 REM * POINTER POKE SU BROUTINE * PC 1000 POKE DL+5,97: POKE DL +101,112 PO 1010 POKE 89,97 IN 1020 Z=2 KE 1030 RETURN HE 1999 REM * POINTER POKE S UBROUTINE * MC 2000 POKE DL+5,65: POKE DL +101,80 PK 2010 POKE 89,65 11 2020 7 = 0 KF 2030 RETURN NG 2999 REM *** ML READ SUB ROUTINE *** CC 3000 PAGE6=1536 HB 3010 FOR I=Ø TO 58 LH 3020 READ OBJ MD 3030 POKE PAGE6+I, OBJ EP 3040 NEXT KI 3050 RETURN LN 3999 REM ** MACHINE LANGU AGE DATA ** BI 4000 DATA 104, 169, 5, 133, 2 04, 169, 6, 162 LN 4010 DATA 6,160,15,32,92, 228, 96, 165 0A 4020 DATA 20,41,1,208,29, 164, 204, 185 PB 4030 DATA 53,6,141,85,128 136, 185, 53 KP 4040 DATA 6,141,181,128,1 92,0,240,6 LK 4050 DATA 136, 132, 204, 76, 50,6,169,5 CD 4060 DATA 133,204,76,95,2 28,80,65,112 OC 4070 DATA 97,144,129 **Program 2: Spinning Globe**

Demo (16K)

KI 5 REM DISCONNECT DISK DRI FN 10 POKE 106,64: GRAPHICS Ø :POKE 559, Ø:GOSUB 3000 DF 5Ø DEG AB 59 REM ** SETUP GRAPHICS MODE ** 00 60 GRAPHICS 7

KF 70 POKE 710, 144: POKE 712, 144: COLOR 1 REM ** CALCULATE START OF DL **



Program 2 also simulates a spinning globe via page flipping, but uses medium-resolution graphics to save memory.

EK 80 DL=PEEK (560) +256 PEEK (561) NH 9Ø XØ=79: YØ=39: RDS=38: Z=1 60 99 REM **** DRAW GLOBE RO UTINE *** EP 100 FOR ROT=6 TO 0 STEP -FC 11Ø FOR ANG=ROT TO ROT+18 Ø STEP 9 EB 120 R=RDS*COS (ANG) CH 13Ø X = XØ + R * COS(27Ø)MG 140 Y=YØ+RDS*SIN(27Ø) LC 150 PLOT X, Y FOR CIR=280 TO 450 ST AM 160 EP 10 IN 170 X=R*COS(CIR) FL 180 Y=RDS*SIN(CIR) KP 190 DRAWTO XØ+X, YØ+Y IF ANG=ROT THEN DRAWT CM 200 O XØ-X, YØ+Y: PLOT XØ+X , YØ+Y LA 210 NEXT CIR KJ 22Ø NEXT ANG KK 230 ON Z GOSUB 1000, 2000, 3000 MX 240 NEXT ROT LD 25Ø A=USR (PAGE6) 6P 26Ø END ED 999 REM * POINTER POKE SU BROUTINE * HB 1000 POKE DL+5,32 PD 1010 POKE 89,32 IN 1020 Z=2 KE 1030 RETURN HE 1999 REM * POINTER POKE S UBROUTINE * HE 2000 POKE DL+5,16 P6 2010 POKE 89,16 IL 2020 $Z = \emptyset$ KF 2030 RETURN NG 2999 REM *** ML READ SUB ROUTINE *** CC 3000 PAGE6=1536 6P 3Ø1Ø FOR I = Ø TO 47 LM 3020 READ OBJ ND 3030 POKE PAGE6+I, OBJ EP 3040 NEXT KI 3Ø5Ø RETURN REM ** MACHINE LANGU LN 3999 AGE DATA ** DATA 104,169,2,133,2 BF 4000 04,169,6,162 LN 4010 DATA 6, 160, 15, 32, 92, 228,96,165 NI 4020 DATA 20,41,1,208,21, 164,204,185 LF 4Ø3Ø DATA 45,6,141,167,47

,192,0,240

28, 16, 32, 48

6,169,2

FO 4040 DATA 5,198,204,76,42

PD 4050 DATA 133, 204, 76, 95, 2

Commodore 64 Hi-Res Quick Clear

Paul W. Downing

Here's a machine language routine that clears the Commodore 64's highresolution screen in less than a second.

If you've ever used high-resolution graphics on the Commodore 64, you probably know how long it takes to clear the hi-res screen in BASIC. You need to POKE 8,000 memory locations with zeros, usually with a line like this:

FOR J=8192 TO 16192:POKE J,0:NEXT

This takes about 30 seconds not a very long time, but it can seem almost endless if you're staring at a PLEASE WAIT message on the screen, waiting for the program to set up.

"Quick Clear" is a short machine language routine that clears the hi-res screen in less than one second. It can be inserted in any program that uses high-resolution graphics. You don't need to understand machine language to use it—just type it in and enter RUN. This installs the ML in the cassette buffer, starting at location 828. Once the routine is in place, use SYS 828 whenever you want to clear the hires screen.

Fill With Any Value

If you've never used hi-res graphics before, try this experiment. Run Quick Clear, then enter the following line to put your 64 in bitmap mode:

POKE 53265,PEEK(53265)OR32: POKE 53272,PEEK(53272)OR8

The screen will be full of garbage. Now press SHIFT-CLR/ HOME and enter SYS 828. The screen will clear in a heartbeat.

Ordinarily, you'll want to clear the screen with zeros. But you can also use this routine to fill the hi-res screen with any value from 0 to 255. Just change the second number in the third DATA statement from 0 to the desired number.

The ML routine is relocatable, so you don't need to put it in the cassette buffer. To change its location, change the variable SA in line 10 from 828 to another safe address (49152, for example).

The variable HS in line 10 is the starting address of the hi-res screen. If you locate the screen at some address other than 8192, be sure to change HS to match.

Quick Clear

Please refer to "COMPUTEI's Guide to Typing In Programs" before entering this listing.

10 SA=828:HS=8192:POKE2, HS-256

	*INT(HS/256):POKE	3, INT (HS	12
	56)	:rem	30
20	FORA=SATOSA+31:RE	ADB: POKE	Α,
	B:NEXT	:rem	74
30	DATA 165,2,133,4,	165,3	
		. mom 1	02

:rem 193 40 DATA 133,5,162,30,160,0 :rem 233

50 DATA 169,0,145,4,136,208 :rem 45 60 DATA 251,230,5,202,16,242

:rem 81 70 DATA 160,64,145,4,136,16 :rem 45 80 DATA 251,96 :rem 181



Unlocking IBM BASIC Programs

Peter F. Nicholson

This short utility unlocks BASIC programs which have been saved in protected format with the P option. It works on any IBM PC or PCjr.

IBM BASIC lets you save a program in three formats: in tokenized (compressed binary) form, as an ASCII file, or as a protected (encoded binary) program. The commands for these options are:

SAVE "filename" (tokenized)
SAVE "filename",A (ASCII)
SAVE "filename",P (protected)

In each case, DOS automatically appends the extender .BAS and does not indicate the format on disk directories. You can load a program saved in any format with LOAD "filename.BAS", omitting the .BAS extender if you wish.

Although a protected program loads and runs normally, it cannot be listed or edited, and neither BASIC nor DOS provides a way to "unlock" it. So when you save a program in protected format, you should also save an unprotected copy in case you decide to make some changes later. If you find yourself without a backup, however, the following utility can remove the protection.

Type in and save UNPROT. UTL. Note that you must save it with the filename UNPROT.UTL. When you run it, you'll be prompted to enter the active drive (enter A if you have one drive) and the name of the protected program. The drive runs briefly as the protection is removed, and then your program is listed on the screen, ready for you to edit or resave.

Invisible Fingers

To mimic the effect of entering direct keyboard commands, UNPROT.

UTL assigns strings to the ten special function keys. It then manipulates the keyboard buffer to enter each string automatically, as if the function keys were being pressed in sequence by invisible fingers. If you use DOS 2.1, the subroutine at line 2000 automatically enters the function keystrokes for you. If you have another version of DOS, you'll have to delete the GOSUB 2000 statement from line 290 and press F1 through F10 in sequence yourself, after entering the filename.

Mimicking keystrokes is an efficient technique, but it makes a program somewhat difficult to follow. If you're interested in how this utility works, here's a brief explanation of how protected programs can be unlocked.

The Key Addresses

The first thing you need to learn is where the program starts and ends in memory. As explained in Appendix I of the *IBM BASIC Manual*, these addresses can be found with the following PEEKs:

PEEK(&H30) + 256*PEEK(&H31)

Program starting address
PEEK(&H358)+256*PEEK(&H359)-1

Program ending address

The starting address is the same in every case; you can find it simply by entering NEW followed by the first PEEK statement above. Finding the ending address is more difficult, as you'll find if you load a protected program and enter the second statement. All you'll get for your trouble is an illegal function call error.

However, there's another way to get the same information. Scalar variables are stored immediately after the end of a BASIC program, and the VARPTR function can find the address of any variable. All you need to do is define an arbitrary scalar variable, CHAIN the protected program into memory, and use VARPTR to find the address of the dummy variable.

Breaking The Chains

Unlike the LOAD command, which clears variables, CHAIN brings a program into memory and begins execution at a specified line number without destroying preexisting variables. This is the method used in UNPROT.UTL. We don't want to run the chained program after it's in memory, so the CHAIN command uses a nonexistent line number (65529). This simply halts execution with an illegal function call error.

Subtracting a few bytes to account for the variable descriptor gives us the exact address where the program ends. To determine its length, we subtract the starting address from the ending address.

Now that we know the program's starting address and length, we BSAVE it back to disk as a binary file. After performing a second NEW, it's necessary to set the pointers for the start of scalar variables, arrays, and strings at the spot where the program ends. Finally, the program is BLOADed back into memory at the correct starting address, and the unlocking process is complete.

If you would rather not type in this program, send a formatted disk with a self-addressed, postage-paid mailer and a \$3.00 check to:

> Peter F. Nicholson 1701 South Princeton Road Ottawa, Kansas 66067

UNPROT.UTL

Please refer to "COMPUTE!'s Guide to Typing In Programs" before entering this listing.

- I) 80 REM 'UNLOCK' PROGRAMS SAVE D IN PROTECTED FORMAT.
- MA 90 REM LOADS A PREVIOUSLY PRO TECTED PROGRAM INTO MEMORY
- MB 95 REM WITHOUT PROTECTION, SO PROGRAM CAN BE LISTED AND SAVED.
- KD 96 REM IBM BASIC VERSIONS 1.1 AND 2.0
- JL 100 DEF SEG:CLEAR:KEY OFF:CLS :ON ERROR GOTO 300
- HJ 110 B%-0:A-0 NM 120 GOSUB 1000

KD 13Ø A=PEEK(&H3Ø)+256*PEEK(&H3

IL 140 LINE INPUT "PROTECTED FIL E DRIVE ";G\$: IF LEN(G\$)>Ø THEN IF INSTR(G\$,":")=Ø THEN G\$=G\$+":"

HO 150 LINE INPUT "PROTECTED FIL E NAME "; F\$: IF INSTR(F\$," .") =Ø THEN F\$=F\$+".BAS"

HP 16Ø G\$=G\$+F\$

DI 170 F\$="PROT.SCR"

HG 180 H\$="PROT.DAT": I\$="UNPROT.

HK 190 KEY 1, "B=VARPTR(B)"+CHR\$(13)

IF 200 KEY 2, "BSAVE F\$, A, B-A" QL 210 KEY 3, "-4: BSAVE H\$, B, "

ML 220 KEY 4, "4: CHAIN I\$,500"+CH R\$(13)

ON 230 KEY 5, "BLOAD"+CHR\$ (34)

ME 24Ø KEY 6, H\$+CHR\$(34)+", 856"+ CHR\$ (13)

EI 250 KEY 7, "BLOAD"+CHR\$ (34)+F\$ IH 260 KEY. B, CHR\$ (34)+", "+STR\$ (A)+CHR\$ (13)+"LIST"+CHR\$ (13

AC 270 KEY 9, "FOR I=1TO 10:KE"

HN 28Ø KEY 1Ø, "Y I, "+CHR\$ (34)+CH R\$ (34) +": NEXT"+CHR\$ (13)

LJ 290 GOSUB 2000: COLOR 0,0: CHAI N G\$,65529!,ALL

EE 300 FOR I=1 TO 10:KEY I, "":NE XT I

DH 310 COLOR 7,0: IF ERL=290 AND ERR=53 THEN CLS: BEEP: PRIN T G\$+" DOES NOT EXIST":RE SUME 140

NE 320 ON ERROR GOTO 0: END

68 500 B=0:DIM B1%(2):COLOR 7.0

D 510 BLOAD "PROT. DAT", VARPTR (B

DB 520 FOR I=0 TO 2: IF B<2^15 TH EN B1%(I)=B ELSE B1%(I)=B -2^16

MC 53Ø NEXT I:BSAVE "PROT.DAT", V ARPTR(B1%(Ø)),6

DC 54Ø NEW

HH 1000 PRINT "UNPROTECTING BASI C PROGRAMS"

N 1010 LOCATE 4,10:PRINT "1. YO U WILL BE PROMPTED FOR T HE FILE DRIVE AND NAME"

PC 1040 LOCATE 7,10:PRINT "2. TH E FINAL STEP IS THE LIST ING OF YOUR PROGRAM"

6F 1050 LOCATE 16,1:PRINT "NOTE: FUNCTION KEYS ARE CLEAR ED BY THE PROGRAM AND TW O SCRATCH"

KM 1060 LOCATE 18,1:PRINT "FILES , PROT.SCR AND PROT.DAT ARE LEFT ON YOUR DEFAULT DRIVE"

DH 1070 LOCATE 25,1:PRINT "PRESS ANY KEY TO START";

CB 1080 KB\$=INKEY\$: IF KB\$="" GOT D 1090: 'CLEAR KEYBOARD

EN 1090 KB\$=INKEY\$: IF KB\$="" GOT 0 1090

EF 1100 CLS: RETURN

6F 2000 REM ** SET KEYBOARD BUFF ER TO ENTER F1 THROUGH F 1Ø AUTOMATICALLY***

DH 2010 REM ** IBM P C DOS VERSION 2.1 ***

J6 2020 DEF SEG=&H40:FOR I=1 TO 10:POKE 2*I+28,0:POKE 2* I+29,58+I:NEXT I

CO 2030 POKE 2*I+28,13:POKE 2*I+ 29, 28: POKE 26, 30: POKE 28 ,50: DEF SEG: RETURN

Fast Atari Circles

Owen Sexsmith

Draw circles, stars, diamonds, and other geometric shapes in Atari BASIC quickly and easily, all with a single subroutine written in machine language. For the Atari 400/800, XL, and XE computers.

Unlike some newer versions of the language, Atari BASIC has no CIR-CLE statement, so drawing circles can be a slow and cumbersome process. But with "Fast Atari Circles," you can easily draw circles, ellipses, stars, and a galaxy of other shapes. The routine is written in machine language for maximum speed, but you don't need to understand ML to use the routine in your own programs.

Type in and save Fast Atari Circles. When you run it, you'll see a pattern of finely drawn, elliptical lines. After that, the program generates colored disks, open stars, hexagons, diamonds, and other complex shapes in various graphics modes.

Believe it or not, all these shapes were created with just one routine. As you can see from the program, GOSUB 900 is used whenever graphics are generated. Line 900 consists of a single USR statement (which calls the machine language subroutine), followed by RETURN. The USR statement includes several descriptively named variables, such as XCENTER and YRADIUS. To create a shape, you simply assign values to these BASIC variables, then call the Fast Circles routine with USR.

Defining The Variables

XCENTER and YCENTER locate your shape on the screen. XCENTER defines the X coordinate, or horizontal location. Give XCENTER a small value to put the shape near the left of the screen, and larger values to move it to the right. YCENTER defines the Y coordinate, or vertical location. Smaller YCENTER values put the shape higher on the screen, and larger values move it down. XRADIUS and YRADIUS define the shape's width and height, respectively.

To learn how these four variables interact, look at lines 165-220. In line 165, XCENTER and YCENTER are given values that place the shape in the middle of the screen. In lines 205-220, a FOR-NEXT loop increases the values of XRADIUS and YRADIUS each time the loop is executed. Since XRA-DIUS is always greater than YRA-DIUS, the shape is wider than it is high, forming an ellipse. In lines 225-240, the process is repeated, giving YRADIUS greater values than XRADIUS, so the ellipse is higher than it is wide.

By changing the STEP values in lines 205 and 225, you can change the distance between the lines. For example, try STEP 3 instead of STEP 5 in line 205, and STEP 1 instead of STEP 5 in line 225. You'll see an interesting moiré effect in areas where the two shapes overlap. If you'd like to experiment further, add these two lines:

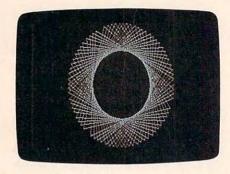
> 201 XRADIUS=96: YRADIUS=96: GOSUB 900 202 GOTO 202

When you run the program again, it draws one shape and pauses in an endless loop at line 202. Since XRADIUS and YRADIUS are equal, the shape is a circle (some TV sets and monitors may be mildly distorted, making the circles look slightly elliptical).

Press BREAK to stop, and edit line 175 so that DELTA=32. When the program runs, you should see an octagon. When DELTA=64, it becomes a diamond. If you change DELTA to an odd value such as 81,

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the program draws a complex series of lines that eventually overlap to form a thick doughnut shape. When you're done experimenting with this section, delete lines 201 and 202.



A small example of some shapes you can draw with "Fast Atari Circles."

Using The Routine

The demonstration program contains REMarks explaining what each section does. By studying the program and experimenting with other sections, you can quickly learn how to handle all the variables used by the Atari Fast Circles routine.

To use this routine in your own programs, you'll need to include lines 50-60, 70, 900, and 1000-1135. Lines 50-60 create a table of sine values in SINE\$. Line 70 builds the machine language routine in CIRC\$. Line 900 contains the line-drawing USR call, and lines 1000-1135 are the machine language data. Put the lines that create CIRC\$ and SINE\$ in the setup portion of your program. Once the setup is complete, you're ready to create your own graphics masterpieces.

Fast Atari Circles

Please refer to "COMPUTEI's Guide to Typing In Programs" before entering this listing.

PL 10 GRAPHICS 2+16: POSITION

5,4:? #6; "PLEASE WAIT
":? #6:? #6;"
(7 SPACES)loading"
EI 40 REM
HM 42 REM BUILD A SINE TABLE
IN SINE\$
EN 45 REM
HM 50 DEG :DIM SINE\$(65):FOR
I=0 TO 64:X=INT(256*S
IN(90/64*I)+0.5)
IL 55 IF X>255 THEN X=255
FI 60 SINE\$(I+1)=CHR\$(X):NEX
T I
EP 65 REM

EA 66 REM PUT M.L. ROUTINE I IF 480 GOSUB 900 N CIRCS 01 49Ø NEXT J: NEXT I 01 495 FOR I=1 TO 300:NEXT I FR A7 REM PG 79 DIM CIRC\$ (280): FOR I=1 GOTO 500 60 500 TO 280: READ X: CIRC\$ (I ED 900 X=USR (ADR (CIRC\$), ADR (SINE\$), XCENTER, YCENTE)=CHR\$(X):NEXT I HK 15Ø REM R, XRADIUS, YRADIUS, ARC START, ARCEND, 256 * KOLO 0A 155 REM ELLIPSES HL 160 REM R+DELTA): RETURN IJ 165 XCENTER=160: YCENTER=9 EF 1000 DATA 104, 104, 133, 231 , 104, 133, 230, 104, 133 LN 17Ø ARCSTART=Ø: ARCEND=Ø 217 KF 175 KOLOR=1:DELTA=2 FJ 1005 DATA 104, 133, 216, 104 KN 200 GRAPHICS 8+16 ,133,228,133,229,104 FOR I = Ø TO 75 STEP 5 LE 205 133 06 21 0 XRADIUS=5+2*I: YRADIUS EK 1010 DATA 218, 104, 104, 133 ,219,104,104,133,220 LB 215 GOSUB 900 194 BH 220 NEXT I EI 1015 DATA 104, 133, 221, 104 LD 225 FOR I = Ø TO 45 STEP 5 , 104, 133, 222, 104, 141 DI 230 XRADIUS=5+1: YRADIUS=5 , 251 +7 # T JB 1020 DATA 2, 104, 133, 223, 1 LD 235 GOSUB 900 62,0,134,227,165,227 BO 240 NEXT I 08 1025 DATA 56,233,64,133,2 FOR I=1 TO 300: NEXT I DR 245 27, 165, 221, 56, 229, 22 HL 25Ø REM PO 255 REM DISKS CP 1030 DATA 133, 224, 144, 240 HM 260 REM ,165,227,41,128,133, PI 265 KOLOR=1: DELTA=1: GRAPH 225 ICS 7+16 FE 1035 DATA 165, 227, 41, 64, 2 LH 270 FOR I=6 TO 27 STEP 3 40,7,169,64,56,229 OJ 275 XCENTER=1Ø+4*I:YCENTE PK 1040 DATA 224, 133, 224, 165 R=1Ø+2*I ,227,240,6,201,192,2 CE 28Ø FOR J=Ø TO I 40 IH 285 XRADIUS=J: YRADIUS=J: A A6 1Ø45 DATA 2,162,128,134,2 RCEND= NOT J 26, 164, 224, 177, 230, 1 LE 290 GOSUB 900 33 CJ 295 NEXT J PH 1050 DATA 214, 165, 220, 133 BP 300 KOLOR=KOLOR+1: IF KOLO ,215,169,0,133,212,1 R>3 THEN KOLOR=1 62 NEXT I CA 3Ø5 CN 1055 DATA 8,70,214,144,3, HI 310 REM 24,101,215,106,102 KB 315 REM SQUARES NA 1060 DATA 212, 202, 208, 243 HJ 320 REM ,166,225,240,5,73,25 PL 325 GRAPHICS 3+16: DELTA=6 DP 1065 DATA 24, 105, 1, 24, 101 FL 33Ø REM SIXTY-FOUR IS A Q ,218,133,84,169,64 UARTER ARC EH 1070 DATA 56, 229, 224, 168, EH 335 XCENTER=20: YCENTER=12 177,230,133,214,165, MD 337 FOR K=Ø TO 1: ARCSTART 219 =32*K: ARCEND=32*K N 1075 DATA 133,215,169,0,1 NC 340 FOR I=0 TO 5: KOLOR=KO 33,212,162,8,208,2 LOR+1: IF KOLOR>3 THEN J6 1080 DATA 208, 138, 70, 214, KOLOR=1 144,3,24,101,215,106 A0 345 FOR J=Ø TO 1 60 1085 DATA 102,212,202,208 MB 350 XRADIUS=2*I+J: YRADIUS , 243, 133, 227, 166, 226 =2 * I + J ,240 LC 360 GOSUB 900 N 1090 DATA 16,165,216,56,2 KJ 37Ø NEXT J:NEXT I:NEXT K 29, 227, 133, 85, 165, 21 DF 375 FOR I=1 TO 300: NEXT I HP 380 REM EA 1095 DATA 233,0,133,86,24 PD 385 REM VARIOUS OTHER SHA , 144, 13, 165, 216, 24 14 39Ø REM JK 1100 DATA 101,227,133,85, LI 400 GRAPHICS 7+16: KOLOR=0 165, 217, 105, 0, 133, 86 :DIM S(4),E(4),I(4) 00 1105 DATA 166,228,208,40, IP 4Ø5 S(1)=Ø:E(1)=Ø:I(1)=64 162,96,134,228,169,1 :S(2)=193:E(2)=191:I(2) = 102LF 1110 DATA 157,66,3,169,0, MG 410 S(3)=16:E(3)=16:I(3)= 157,72,3,157,73 32:S(4)=Ø:E(4)=Ø:I(4) BK 1115 DATA 3,173,251,2,32, 86,228,169,17,157 EN 420 XRADIUS=10: YRADIUS=10 LE 1120 DATA 66,3,169,12,157 CM 43Ø FOR I=Ø TO 3:S=4-I:FO ,74,3,169,0,157 PB 1125 DATA 75,3,240,9,162, R J=Ø TO 3 KOLOR=KOLOR+1: IF KOLO 96,32,86,228,166 R>3 THEN KOLOR=1 PF 113Ø DATA 229, 208, 16, 165 F6 45Ø S=S+1: IF S>4 THEN S=1 221,24,101,223,133,2 EJ 460 XCENTER=20+40*J:YCENT 21 ER=12+20 * I EF 1135 DATA 197, 222, 208, 142 A0 47Ø ARCSTART=S(S): ARCEND= ,202,134,229,208,137 E(S): DELTA=I(S)

Apple Universal INPUT

William Simpson

Banish EXTRA IGNORED errors from your Applesoft programs with this short INPUT routine. It works on any Apple II series computer with DOS 3.3 or ProDOS.

As you know if you've ever tried it, Applesoft BASIC won't let you type commas or colons when responding to an INPUT prompt. The computer rejects everything after the punctuation and gives you an EXTRA IGNORED error. There's a good reason for this, but there may be times when you'd like an input string to include the punctuation. For example, you might want to input a time value in response to a prompt like: ENTER HOURS:MINUTES.

"Apple Universal Input" solves this problem and can be used as a routine in any Applesoft BASIC program. Once installed, it lets you input strings containing commas and colons, from the keyboard or from disk.

Type in and save the following program, then enter RUN and type any string containing commas or colons. The program prints the string to show that the input was accepted without errors.

You'll notice that the input prompt is a greater-than sign (>) rather than a question mark. This signals that the normal Applesoft INPUT command is not in use. If you don't like this prompt, you can easily change it to another character. Find the ASCII code for the character you prefer, add 128 to the ASCII

code, and substitute that value for the second DATA number in line 270 of the program. For example, the < character has an ASCII code of 60. To use that character as the prompt, you would replace the second DATA number in line 270 with 188 (60 \pm 128).

Program Breakdown

Let's look at the example program to learn how this input routine can be used in other programs.

Line 100 defines the variable T\$. It's essential that this be the first variable your program defines.

Line 110 POKEs a short machine language (ML) routine into memory; the DATA for this routine is contained in lines 270–300. Lines 120 and 130 print a prompt on the screen, and call the new input routine with GOSUB 190. When using this routine in your own programs, you should use a similar GOSUB whenever you want to input a new string. Note that the string is returned in the variable A\$ (line 140).

The BASIC subroutine calls the ML routine (CALL 768) to bring the input string into the computer's memory. Using the ROM GETLN routine, the ML routine first moves the string into the input buffer. Then it stores the string's length in location 798, subtracts 128 from each character's value to obtain the correct ASCII codes, and returns control to BASIC.

Lines 200–260 move the string from the input buffer to a safe place in memory where it can accessed by the main program. The vehicle for this transfer is the string variable T\$,

which you'll recall was the first variable defined in the program. This is done so that you can find the descriptor for T\$ by PEEKing the pointer in locations 105–106.

Variable Descriptors

As you may know, a simple variable descriptor consists of five bytes in the following form:

Byte # Function

- 1 = First letter of the variable's
- 2 = Second letter of the name
- 3 = Length of the variable
- 4 = Low byte of the variable's memory address
- 5 = High byte of the variable's memory address

By manipulating the descriptor for the variable T\$, it is relatively simple to transfer the string from the input buffer (where it would quickly be overwritten) to another string variable (A\$ in example program).

After the descriptor is located (line 210), its third byte is POKEd with the length of the string (line 220), and the fourth and fifth bytes are POKEd with the low byte/high byte address of the input buffer (lines 230–240). T\$ is now set to the correct length and its descriptor points to the input buffer.

The final step (line 250) is to copy T\$ into A\$, using a form of the MID\$ function that extracts every character from T\$. You may substitute other names for T\$ and A\$, of course, when using this routine in your own programs.

Applesoft Universal Input

```
100 T$ = ""
110 FOR I = 768 TO 798: READ A:
    POKE I, A: NEXT
12Ø HOME
13Ø PRINT "INPUT ANYTHING": GOS
   UB 19Ø
14Ø PRINT "ANYTHING==> "; A$
15Ø PRINT
16Ø INPUT "ANY MORE? (Y OR N) "
170 IF YT$ = "Y" THEN 120
18Ø END
19Ø CALL 768
200 B1 = PEEK (798)
21Ø B2 = PEEK (1Ø6) * 256 + PEE
    K (105)
22Ø POKE B2 + 2, B1
23Ø POKE B2 + 3,Ø
240 POKE B2 + 4,2
25Ø A$ = MID$ (T$,1)
26Ø RETURN
         169, 190, 133, 51, 32, 106
27Ø DATA
    , 253, 142
28Ø DATA
          30,3,164,0,204,30,3,2
29Ø DATA
          12,185,0,2,41,127,153
300 DATA
          2,200,76,12,3,96,0,00
```

Hardcopy Sprites For Commodore 64

Thomas H. White

Make a hardcopy printout of any Commodore 64 sprite with this BASIC program for the VIC-1525, MPS-801, or MPS-802 printer. It's easily adapted to other printers as well.

Have you ever wished you could print a sprite on paper? For example, you may want to check some detail on a sprite you designed without bothering to load and run the program. With "Hardcopy Sprites," you can check such details in seconds rather than minutes, and even compile a personal library of sprite shapes for future reference.

Ordinary screen dump programs can't make sprite printouts because the data that defines sprite shapes isn't located in regular screen memory. To print out a sprite, you need a program that reads the 64byte memory area where the sprite

shape is actually stored.

Hardcopy Sprites uses this technique to print a 24 × 21 character representation of any sprite, with vertical or horizontal expansion if you wish. Large ball-shaped characters form single-color sprites, and additional characters represent multicolor sprites. Figures 1 and 2 show two examples of what is possible.

After typing and saving the program, POKE your sprite data into memory and note the address where it begins. Then simply run Hardcopy Sprites and follow the prompts. The program asks you to enter the memory address where the sprite data begins, to give the sprite a descriptive name, to choose horizontal or vertical expansion (or both), and to select single-color or multicolor mode.

Non-Commodore Printers

Hardcopy Sprites is written for Commodore printers, but is readily adapted to other printers. If your printer can't handle Commodore

graphics, replace the ball-shaped Commodore graphics character (SHIFT-Q in the program listing) in lines 200, 210, 230, 340, and 360 with some other character, such as an X or a plus sign. With a little extra work, you could also incorporate Hardcopy Sprites as a subroutine within a BASIC sprite editor

Figure 1: Expanded Single-Color Sprite

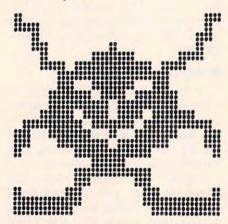
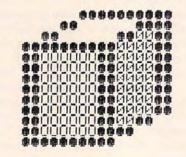


Figure 2: Unexpanded Multicolor Sprite



Hardcopy Sprites

Please refer to "COMPUTEI's Guide to Typing In Programs" before entering this listing.

- 10 REM ** SPRITE HARDCOPY **
- :rem 30 20 INPUT" [CLR] [DOWN] SPRITE DAT A MEMORY LOCATION"; PG
- :rem 207 30 INPUT" {CLR} { DOWN } EXPAND X D IR. (Y/N)"; EX\$:rem 35

45	INPUT"	[DOWN]	SPRITE	NAME'	'; N\$
				:rem	
47			MULTICO		
	(Y/N)			:ren	n 82
	OPEN1,			:rem	
			(15)"ME		LOC
	ATION"	PG" [2	SPACES]		
				:rem	
	FORR=Ø		The same of the sa	:rem	
70	FORC=Ø	TO2:P=	PEEK (PC		
00.				:rem	
			P-1:V(E		
	INT(V(m/**/ n \ \	:rem	111
			T(V(B))		202
100	TLA (B)>OTHE	NGOSUB2		104
110	TENTO	\-amir	NGOSUB2	:rem	184
110	IFV(B)=OTHE	NGOSUBZ		100
120	NEXTB			:rem	
130		7TO7 . I	\$=L\$+D\$		1 20
130	TORB-	0107.11	4-п 4-п4	:rem	120
140	NEXTR	: NEXTC		:rem	
150			HENPRIN		
130			6)+"28"		
	(8)	CIIIQ (I	071 20	:rem	255
160		="V"TH	ENFORRE		
100			15)+CHF		
			8):NEXT		
			S / • 11 D.11	:rem	201
170	LS=""	:NEXTR		:rem	
180	PRINT	#1:CLO	SE1:END	:rem	108
200	DS(B)	="0"		:rem	223
210	IFM\$=	"N"AND	EX\$="Y"	THEND	\$ (B
)="00	11		:rem	1 29
220	IFM\$=	"Y"AND	EX\$="N"	THENG	OSU
	B300			:rem	1 19
230	IFM\$=	"Y"AND	EX\$="Y"	THEND	
)="QQ	":GOSU	B32Ø	:rem	
210					110

55 PRINT#1,CHR\$(15)"MEMOR ATION"PG"{2 SPACES}"N\$	
:re	
60 FORR=0TO60STEP3 :re	
7Ø FORC=ØTO2:P=PEEK(PG+R+	-C)
:re	
8Ø FORB=7TOUSTEP-1:V(B)=F	170 170 P=
INT(V(B)) :re	
90 V(B)=V(B)-INT(V(B)):re	
100 IFV(B)>0THENGOSUB200	111 202
:re	m 184
110 IFV(B)=0THENGOSUB250	104
	m 189
	em 20
130 FORB=0T07:L\$=L\$+D\$(B)	
	m 129
	m 210
150 IFEY\$<>"Y"THENPRINT#1	CHRS
(15)+CHR\$(16)+"28"+L\$	+CHR\$
	m 255
160 IFEY\$="Y"THENFORRE=07	
INT#1,CHR\$(15)+CHR\$(1	
6"+L\$+CHR\$(8):NEXTRE	.0/+ 1
:re	m 201
	em 84
180 PRINT#1:CLOSE1:END:re	
	m 223
210 IFM\$="N"ANDEX\$="Y"THE	NDS (B
	em 29
220 IFMS="Y"ANDEXS="N"THE	
B300 :r	em 19
230 IFM\$="Y"ANDEX\$="Y"THE	NDS/B
	m 121
240 RETURN :re	
	em 19
260 IFMS="N"ANDEXS="Y"THE	NDS (B
260 IFMS="N"ANDEXS="Y"THE)="{2 SPACES}" :re	m 128
270 IFM\$="Y"ANDEX\$="N"THE	NGOSII
B340 :r	em 28
280 IFM\$="Y"ANDEX\$="Y"THE	NDS (B
)="{2 SPACES}":GOSUB3	60
;re	
290 RETURN :re	
300 IFB=60RB=40RB=20RB=0T	HENTE
DS(R+1)=" "THENDS(R+1)="Ø"
:D\$(B)="Ø" :re	m 128
310 RETURN :re	
320 IFB=60RB=40RB=20RB=0T	
D\$(B+1)="{2 SPACES}"T	HENDS
(B+1)="ØØ":D\$(B)="ØØ"	
	m 226
330 RETURN :re	
340 IFB=60RB=40RB=20RB=0T	HENTE
D\$(B+1)="Q"THEND\$(B+1 :D\$(B)="O" :re)="0"
:D\$(B)="O" :re	m 147
350 RETURN :re	m 120

40 INPUT" [7 SPACES]Y DIR. (Y/N

:rem 194

:rem 122

D\$(B+1)="QQ"THEND\$(B+1)="0

360 IFB=60RB=40RB=20RB=0THENIF

O":D\$(B)="00"

370 RETURN

:rem 4

IBM Variable Lister

Peter F. Nicholson

This handy utility lists all the variables in your IBM BASIC programs. It runs on any PC with at least 64K RAM or PCjr with at least 128K RAM.

The ability to list variables is a valuable aid in debugging and documenting BASIC programs. The three programs accompanying this article show how IBM BASIC variables are stored and let you list the variables in any IBM BASIC program.

"Variable Lister" (Program 3) is the actual utility. Programs 1 and 2 demonstrate how IBM BASIC stores variables for those who are interested in the details (see below). But you don't have to be familiar with the theory to use Variable Lister.

The first step is to type in and save Program 3. (Note: All three programs assume that your screen is in the 80-column mode. Enter WIDTH 80 from BASIC or MODE 80 from DOS before running the programs.)

Once Variable Lister is saved on disk, there are two ways to run it. The easiest way is to run your own program first, break out, then activate Variable Lister with the CHAIN command. For example, if you have saved Variable Lister under the filename "VARLIST," enter CHAIN "VARLIST",70,ALL and press ENTER. This preserves your program's variables while Variable Lister loads and runs.

After doing this, Variable Lister replaces your program in memory. If you want to get a variable list while your program remains in memory, you need to renumber Variable Lister with line numbers not used in your program, and then merge it

with your program using CHAIN MERGE. See the *IBM BASIC Manual* for details.

Of course, Variable Lister uses variables of its own. To avoid confusion, these variables (BAS, XLEN, CTA, CTV, II1, JJ1, AD0, VARNAME\$, ARRNAME\$, ITV!, and TESTARRAY) are suppressed from the variable list, and should not be used by your program.

The subroutine beginning at line 820 sorts variables and arrays alphabetically. There may be times when you'd rather display them chronologically (the order in which they're defined as the program runs). This is easily done by deleting the statement GOSUB 820 from lines 500 and 520.

How It Works

IBM BASIC uses four types of variables—integer, string, single-precision, or double-precision. The term scalar describes all variables that are not arrays. Appendix I of the IBM BASIC Manual explains how and where scalars are stored. Page I-2 of this appendix shows where the scalar storage area starts, and pages I-3 and I-4 explain the meaning of the data stored there.

If you want to see a graphic illustration of scalar variable storage, type in and save Program 1, then enter RUN. The program defines four variables—each a different type—and displays the descriptor bytes that describe each. You'll see two columns of numbers for each variable. The left column provides a reference number for each byte of the descriptor, and the right column shows the value that each byte contains.

The first byte of the descriptor indicates the variable type. This byte contains a 2 for an integer variable, 3 for a string, and 4 or 8 for a single- or double-precision variable, respectively. The next two bytes hold the first two characters of the variable name. For the variable A, we see the value of 65, the ASCII code for the letter A. The letter B is shown with an ASCII code of 66, and so on.

When a variable name has more than two characters, the fourth byte of the descriptor shows the number of remaining characters. The additional characters are stored immediately after this byte, with 128 added to their ASCII codes. Thus, where the variable is named ABC, you will see the values 65 and 66 (ASCII codes for AB), 1 (the number of remaining characters), and 195 (128 + ASCII code for C). The final bytes in each descriptor, highlighted in reverse video, show the value given to each variable.

Array Variables

The IBM BASIC Manual gives few details about how and where array variables are stored. However, its memory map does show that scalars, arrays, and strings occupy three contiguous areas in memory. You can use these formulas to find the boundaries of each zone:

PEEK(&H358)+256*PEEK(&H359)
Scalar variable space starts
PEEK(&H35A)+256*PEEK(&H35B)-1
Scalar variable space ends

PEEK(&H35A)+256*PEEK(&H35B)
Array space starts
PEEK(&H35C)+256*PEEK(&H35D)-1
Array space ends

PEEK(&H35C)+256*PEEK(&H35D) String space starts



(Of course, the PEEKs won't return meaningful results until your variables have actually been declared. Prior to that time, the storage zones are empty, and the pointers all point to the same place.)

Like scalars, array variables can be any of four types: integer, string, single-precision, or double-precision. Thus, the first part of an array descriptor is the same as a scalar descriptor—first comes a type byte, followed by the characters of the array name—but additional bytes are needed to describe the more complex structure of an array. The two bytes after the name show the number of bytes needed to complete the array; this includes a description of the array's elements and dimensions, and the array data itself.

The next byte in the array descriptor (highlighted in reverse video) shows the number of dimensions in the array. For example, the statement DIM A(2,200) creates a two-dimensional array; the statement DIM B(1,2,3,4,5,6) creates an array with six dimensions. Although it's rarely necessary to use more than a few dimensions, IBM BASIC lets you define an array with as many as 255 of them.

The DIM statement that defines an array also specifies the maximum number of elements in each dimension. The array descriptor contains two more bytes for each dimension in the array, indicating the number of elements in that dimension. An array dimension may contain a maximum of 32,767 elements. If the number of elements is not specified, the default value of 10 elements is assigned.

Program 2 graphically illustrates array storage. Its display is similar to that of Program 1, using reverse video to highlight the area allocated for the array dimension and element numbers.

Lister Details

Strings stored in program lines may not be stored in string space. For example, say that your program has this line:

5 A\$ = "A": B\$ = STRING\$(2,CHR\$(65))

Variable Lister reports both A\$ and B\$ as variables, but the string space is only two bytes long, since the character A for A\$ is stored in line 5 of the program where it is defined.

Functions defined in a program are indicated by the FN prefix and are listed last for the variable type. A function is shown by adding 128 to the code of the first character. If your program contains DEF FNAA%, Variable Lister displays 2, 193 (65+128), 65, 0. Where your program consists of the line 5 A% = 1:DEF FNA% $(X,Y) = X^2 + Y^2$, Variable Lister reports A, FNA, X, and Y as variables.

The program lists array dimensions exactly as defined in your DIM statement, independent of the OP-TION BASE you have selected. If your program consists of the line 5 DIM A(2,2), the report should list A(2,2) and show 47 bytes occupied. If the program consists of 5 OP-TION BASE 1: DIM A(2,2), the report should list A(2,2) and show 27 bytes occupied.

Keep in mind that string space is filled from the top of memory downward. To find the starting address of your stack area, use PEEK(&H30A) + 256 * PEEK (&H30B). Use PEEK(&H32F) + 256 PEEK(&H330) to find the current string space. To get an accurate report, you may first need to issue a FRE("") command as described in the manual.

Finally, Variable Lister cannot report any variable that your program does not actually use. Consider this example:

> 5 D\$="12-31-84":IF RIGHT\$(D\$,2)="85" THEN A=1

Since the IF condition can never be satisfied, the computer never executes A=1. Variable Lister reports only one variable—D\$.

If you would like a copy of this program, send a formatted disk with a self-addressed, postage-paid mailer and a check for \$3.00 to:

> Peter F. Nicholson 1701 South Princeton Road L Ottawa, Kansas 66067

Please refer to "COMPUTEI's Guide to Typing In Programs" before entering these listings.

Program 1: Scalar Variable Storage

6H 100 KEY OFF: DEF SEG: COLOR 7,0 ICLS: PRINT "HOW SCALAR VA RIABLES ARE STORED": PRINT L6 110 A%=0:AB\$="0":ABC=0:ABCD#=

ID 12Ø AD!=PEEK(&H358)+256*PEEK(&H359)

PJ 13Ø PRINT "INTEGER SINGLE PREC. DOUBLE PREC."

HM 14Ø FOR J=1 TO 4

6H 15Ø FOR I=Ø TO PEEK (AD!) +PEEK (AD!+3)+3

0K 16Ø IF I>PEEK (AD!+3)+3 THEN C OLOR Ø,7 ELSE COLOR 7,Ø

CL 170 K=PEEK (AD!+I)

FD 180 LOCATE I+5, 15*(J-1)+1:PRI NT USING "### "; I; K; "; I;K;

0J 19Ø NEXT I

MB 200 AD!=AD!+PEEK(AD!)+PEEK(AD !+3)+4 NE 210 NEXT J

6K 22Ø COLOR 7,Ø

FK 230 PRINT: PRINT "INTEGER

LO 240 PRINT "STRING AB\$= "0" CG 250 PRINT "SINGLE PRECISION

ABC ! = Ø" JB 260 PRINT "DOUBLE PRECISION ABCD#=Ø"

CL 27Ø PRINT STRING\$ (5, CHR\$ (219));" DATA ";

DP 280 LOCATE 15,1

Program 2: Array Variable Storage

EB 1000 KEY OFF: DEF SEG: COLOR 7, Ø: CLS: PRINT "HOW ARRAYS ARE STORED": PRINT

OH 1010 J=1:I=0:K=0:XLEN=0:OPTIO N BASE 1:' DECLARE ALL V ARIABLES USED

LP 1020 DIM ABCD%(1), ABC\$(1), AB! (2,1), A#(1): 'DECLARE SA MPLE ARRAYS

DM 1030 AD!=PEEK(&H35A)+256*PEEK (&H35B)

JO 1040 PRINT TAB(2); "INTEGER"; T AB(18); "STRING"; TAB(32); "SINGLE PREC."; TAB(46);" DOUBLE PREC."

CH 1050 WHILE AD! (PEEK (&H35C) +25 6#PEEK (&H35D) -1: XLEN=PEE K(AD!+3)

JP 1060 FOR I=0 TO XLEN+5+PEEK (A D!+XLEN+4)+256*PEEK (AD!+ XLEN+5)

CF 1070 IF I>XLEN+5 THEN COLOR Ø ,7 ELSE COLOR 7,Ø

OL 1080 IF I>XLEN+6+2*PEEK (AD!+X LEN+6) THEN COLOR 7,0

CA 1090 K=PEEK (AD!+I)

ON 1100 LOCATE I+5,15*(J-1)+1:PR INT USING "### ";I;K;

FE 111Ø NEXT I

LP 1120 AD!=AD!+XLEN+6+PEEK (XLEN +AD!+4)+256*PEEK(XLEN+AD !+5):J=J+1

FN 113Ø WEND

08 2Ø REM

ME 3Ø REM

OL 1140 LOCATE 19,1:PRINT "VARIA BLES: ": PRINT TAB(11); "AB CD%(1)"

CO 115Ø PRINT TAB(11); "ABC\$(1)" 68 1160 PRINT TAB(11); "AB!(2,1)"

NN 1170 PRINT TAB(11); "A#(1)"
KH 1180 PRINT "ARRAY DIMENSION A

ND ELEMENTS PER DIMENSIO N "; CHR\$ (219); CHR\$ (219);

IE 1190 COLOR 7,0 EE 1200 LOCATE 1,79

Program 3: Variable Lister

N 10 REM PROGRAM ANALYZES DATA AREA AND PROVIDES A REPORT ON

2. ARRAYS

Cwww.commodore.ca

1. SCALAR VARIABLES

- KP 40 REM 3. AMOUNT OF MEMORY R EQUIRED FOR VARIABLES
- REM INTERNAL VARIABLES: AD 11 50 Ø!, BAS, CTV, CTA, III, JJ1, XLE
- CL 60 REM ARRAYS: IT V!, VARNAME\$, ARRNAME\$, TMPNA MF#
- MH 7Ø DEF SEG: SCREEN Ø: WIDTH 8Ø: COLOR 7, Ø: KEY OFF: CLS: ON E RROR GOTO 920
- 08 80 LOCATE 1,1:PRINT "SORTING VARIABLES ":
- 66 9Ø BAS=1:DIM TESTARRAY(2):TES TARRAY(Ø)=1:' TEST FOR OPT ION BASE
- CH 100 ERASE TESTARRAY
- NK 11Ø ADØ!=Ø: XLEN=Ø: CTV=-BAS: CT A=-BAS: II1=Ø:JJ1=Ø:DIM IT V! (10-BAS): DECLARE INTE RNAL VAR.
- ED 12Ø ADØ!=PEEK(&H358)+256*PEEK (&H359): 'COUNT NUMBER OF VARIABLES
- MD 13Ø CTV=CTV+1: XLEN=PEEK (ADØ!+ 3)
- BJ 140 ADO!=ADO!+PEEK (ADO!)+XLEN +4
- DI 15Ø IF ADØ!<PEEK(&H35A)+256*P EEK (&H35B) -1 GOTO 13Ø
- DN 160 AD0!=PEEK (&H35A) +256*PEEK (&H35B): ' COUNT NUMBER O F ARRAYS
- FB 170 CTA=CTA+1: XLEN=PEEK (AD0'+ 3)
- FH 18Ø ADØ!=ADØ!+XLEN+PEEK(ADØ!+ 4+XLEN) +256 * PEEK (ADØ! +5+X LEN) +6
- HM 19Ø IF ADØ! < PEEK (& H35C) +256*P EEK (%H35D) -1 GOTO 17Ø
- GF 200 DIM VARNAME\$ (CTV), ARRNAME \$(CTA): 'DECLARE STRINGS FOR VAR. AND ARRAYS
- JH 210 GOSUB 590: 'GET ADDRESS O F INTERNAL VARIABLES
- 00 220 CTV=-BAS: AD0!=PEEK (&H358) +256*PEEK (&H359)
- BE 23Ø XLEN=PEEK (ADØ!+3):FOR II1 =1-BAS TO 7-BAS: IF ADØ!=I TV! (III) GOTO 280
- KL 24Ø NEXT II1:CTV=CTV+1
- 25Ø VARNAME\$ (CTV) = STR\$ (PEEK (A DØ!))+CHR\$(PEEK(ADØ!+1)); 'GET TYPE AND NAME
- KN 26Ø IF PEEK (ADØ!+2) >Ø THEN VA RNAME\$ (CTV) = VARNAME\$ (CTV) +CHR\$ (PEEK (ADØ!+2)):FOR I I1=1 TO XLEN: VARNAME\$ (CTV) = VARNAME\$ (CTV) + CHR\$ (PEEK (ADØ!+3+II1)-128):NEXT II
- IB 27Ø IF PEEK (ADØ!) = 3 THEN VARN AME\$ (CTV) = VARNAME\$ (CTV) +'
- BC 28Ø ADØ!=ADØ!+PEEK(ADØ!)+XLEN +4 68 296
- IF ADØ! < PEEK (&H35A) +256*P EEK (&H35B) -1 GOTO 23Ø
- PA 300 CTA=-BAS: AD0!=PEEK (&H35A) +256*PEEK (&H35B)
- IP 31Ø XLEN=PEEK (ADØ!+3): FOR II1 =8-BAS TO 10-BAS: IF AD0!= ITV!(II1) GOTO 410
- KE 32Ø NEXT II1:CTA=CTA+1
- OK 330 ARRNAME\$ (CTA) = STR\$ (PEEK (A DØ!))+STR\$(PEEK (ADØ!+6+XL EN))+CHR\$(PEEK(ADØ!+1)): GET TYPE AND NAME
- DE 34Ø IF PEEK (ADØ!+2) >Ø THEN AR RNAME\$ (CTA) = ARRNAME\$ (CTA) +CHR\$ (PEEK (ADØ!+2)):FOR I I1=1 TO XLEN: ARRNAME\$ (CTA) = ARRNAME\$ (CTA) + CHR\$ (PEEK (ADØ!+3+II1)-128):NEXT II

- OC 350 IF MID\$ (ARRNAME\$ (CTA), 2,1)="3" THEN ARRNAME\$(CTA)= ARRNAME\$ (CTA) +"\$"
- LL 36Ø ARRNAME\$ (CTA) = ARRNAME\$ (CT A) +" ("
- KJ 37Ø FOR II1=PEEK (ADØ!+XLEN+6) TO 1 STEP -1
- AA 38Ø ARRNAME\$ (CTA) = ARRNAME\$ (CT A) +STR\$ (PEEK (ADØ!+6+XLEN+ 2*II1-1)+256*PEEK (ADØ!+6+ XLEN+2*II1)-BAS)
- AE 390 IF II1=1 THEN ARRNAME\$(CT A) =ARRNAME\$ (CTA) +") " ELSE ARRNAME\$ (CTA) = ARRNAME\$ (C
- EJ 400 NEXT II1
- FM 41Ø ADØ!=ADØ!+XLEN+PEEK (ADØ!+ 4+XLEN) +256*PEEK (ADØ! +5+X LEN) +6
- KL 42Ø IF ADØ! < PEEK (&H35C) +256*P EEK (%H35D) -1 GOTO 31Ø
- AG 43Ø ITV! (1-BAS) = PEEK (& H35A) +2 56*PEEK (&H35B) -PEEK (&H35B)-256*PEEK (&H359)-64
- 61 44Ø ITV! (2-BAS) = PEEK (& H35C) +2 56*PEEK (&H35D) -PEEK (&H35A)-256*PEEK (&H35B)-1Ø2-3*(CTA+CTV+2*BAS)
- EN 45Ø FOR II1=1-BAS TO CTA: ARRN AME\$(II1)=RIGHT\$(ARRNAME\$ (III), LEN (ARRNAME\$ (III))-1)
- HM 460 JJ1=INSTR(1, ARRNAME\$(II1) ,CHR\$(32)): IF JJ1>Ø THEN ARRNAME\$ (III) = LEFT\$ (ARRNA ME\$(II1), JJ1-1) +MID\$(ARRN AME\$(II1), JJ1+1, LEN(ARRNA ME\$(II1))-JJ1)
- EH 47Ø IF JJ1>Ø GOTO 46Ø
- OP 48Ø NEXT II1: IF CTV=-1 THEN C TV=Ø ELSE IF CTV=Ø THEN C TV=1
- FG 49Ø CLS: DIM TMPNAME\$ (CTV): FOR III=1-BAS TO CTV: TMPNAME \$(II1)=VARNAME\$(II1):NEXT TTI
- KJ 500 JJ1=CTV-1:GOSUB 820:II1=0 :GOSUB 860:GOSUB 940:ERAS E TMPNAME\$: CLS: IF CTA=-1 THEN CTA-Ø ELSE IF CTA-Ø THEN CTA=1
- 06 510 DIM TMPNAME\$ (CTA) : FOR II1 =1-BAS TO CTA: TMPNAME\$(II 1) = ARRNAME\$(II1): NEXT II1
- CD 52Ø JJ1=CTA-1:GOSUB 82Ø:II1=1 :GOSUB 860:GOSUB 940:ERAS E TMPNAMES, VARNAMES, ARRNA MES: CLS
- 60 530 PRINT "STRING SPACE USED ", TAB (3Ø);
- ADØ!=FRE(""):ADØ!=PEEK(&H 3ØA) -PEEK (&H32F) -1+256# (P EEK (&H3ØB) -PEEK (&H33Ø)):P RINT USING "#####"; ADØ!
- FL 55Ø PRINT "SCALAR VARIABLE SP ACE", TAB (3Ø); : PRINT USING "#####"; ITV! (1-BAS)
- BH 560 PRINT "ARRAY SPACE", TAB (3 Ø);:PRINT USING "#####"; I TV! (2-BAS)
- DN 57Ø PRINT: PRINT "TOTAL VARIAB LE SPACE ", TAB(3Ø); :PRINT USING "#####"; ITV!(1-BAS)+ITV!(2-BAS)+ADØ!;:PRINT BYTES"
- P 580 GOSUB 940: CLS: END
- N 590 ITV! (1-BAS) = VARPTR (ADØ!) -5: 'SUBROUTINE TO GET INTE RNAL ADDRESSES
- NF 600 ITV! (2-BAS) = VARPTR (XLEN) -6

- JI 61Ø ITV! (3-BAS) = VARPTR (CTV) -5 HC 62Ø ITV! (4-BAS) = VARPTR (CTA) -5
- ITV! (5-BAS) = VARPTR(II1)-5 6L 63Ø
- KI 640 ITV! (6-BAS) = VARPTR (JJ1) -5
- 65Ø ITV! (7-BAS) = VARPTR (BAS) -5 N 660 ITV! (8-RAS) = VARPTR (ITV! (1
- -BAS))-10
- NI 670 ITV! (9-BAS) = VARPTR (VARNAM E\$ (1-BAS))-14
- BF 68Ø ITV! (1Ø-BAS) = VARPTR (ARRNA ME\$ (1-BAS))-14
- FOR II1=1-BAS TO 9-BAS: IF ITV! (III) <Ø THEN ITV! (II 1)=2^16+ITV!(II1)
- DI 700 NEXT III: RETURN
- DO 710 XLEN=0:FOR II1=1-BAS TO C
- HP 720 IF MID\$ (TMPNAME\$ (III), 1, 2)=STR\$(JJ1) AND MID\$(TMPN AME\$(II1),3,1)<"a" THEN P RINT MID\$ (TMPNAME\$ (III).3 LEN(TMPNAME\$(IIi))-2)+SP ACE\$ (2); : XLEN=1
- OK 73Ø IF MID\$ (TMPNAME\$ (III), 1,2)=STR\$(JJ1) AND MID\$(TMPN AME\$(II1),3,1)>"a" THEN P RINT "FN"+CHR\$ (ASC (MID\$ (T MPNAME\$(II1),3,1))-128)+M ID\$(TMPNAME\$(III),4,LEN(T MPNAME\$(II1))-2)+SPACE\$(2);: XLEN=1
- EE 740 NEXT II1
- BL 750 IF XLEN=0 THEN PRINT "NON E": PRINT: PRINT ELSE PRINT :PRINT
- NN 760 RETURN
- KP 77Ø FOR II1=1-BAS TO CTA
- FC 78Ø IF LEFT\$(ARRNAME\$(III),1) =RIGHT\$(STR\$(JJ1),1) THEN PRINT MID\$ (ARRNAME\$ (III) 3, LEN (ARRNAME\$ (II1))-2)+ SPACE\$ (2); : XLEN=1
- F0 79Ø NEXT II1
- AC 800 IF XLEN=0 THEN PRINT "NON E":PRINT:PRINT ELSE PRINT : PRINT
- EK 810 XLEN=Ø: RETURN
- KE 82Ø XLEN=1: WHILE XLEN: XLEN=Ø
- NM 830 FOR III=1-BAS TO JJ1
- LK 84Ø IF TMPNAME\$(II1)>TMPNAME\$ (III+1) THEN SWAP TMPNAME \$(II1), TMPNAME\$(II1+1): XL EN=1
- 01 85Ø NEXT II1: WEND: RETURN
- KM 860 IF II1=0 THEN PRINT "VARI ABLE SPACE "; ITV! (1-BAS); "BYTES": TMP\$="" ELSE PRIN T "ARRAY SPACE "; ITV! (2-B AS); "BYTES OPTION BASE " ; ABS (1-BAS) ; : TMP\$="ARRAYS
- DL 87Ø PRINT:PRINT:PRINT:PRINT " INTEGER "+TMP\$+" - "::JJ1 =2: IF TMP\$="" THEN GOSUB 71Ø ELSE GOSUB 77Ø
- BN 880 PRINT: PRINT: PRINT "STRING "+TMP\$+" - "::JJ1=3:IF T MP\$="" THEN GOSUB 710 ELS E GOSUB 77Ø
- ME 890 PRINT: PRINT: PRINT "SINGLE PRECISION "+TMP\$+" -JJ1=4: IF TMP\$="" THEN GOS UB 710 ELSE GOSUB 770
- PRINT: PRINT: PRINT "DOUBLE PRECISION "+TMP\$+" - ";: JJ1=8: IF TMP\$="" THEN GOS UB 710 ELSE GOSUB 770
- MF 91Ø RETURN
- CI 920 IF ERR=9 AND ERL=9Ø THEN BAS=Ø: RESUME NEXT
- OL 93Ø ON ERROR GOTO Ø
- LOCATE 25,1:PRINT "PRESS CN 940 ANY KEY TO CONTINUE";
- LJ 950 KB\$=INKEY\$: IF KB\$="" GOTO 95Ø ELSE RETURN 0

Apple IIc RAM Disk Mover Part 2

Christopher J. Flynn

Last month, Part 1 of this two-part series demonstrated the RAM disk and subdirectory options with ProDOS and the Apple IIc. This month's article presents a utility program which rapidly copies a number of programs from a floppy disk to the RAM disk, greatly speeding up the preparations required for using the RAM disk.

The discussion in Part 1 was a bit on the theoretical side, but this month we tackle the practical side. "RAM Disk Mover" is a program which automates the processes described in Part 1. It adds a few little twists, however. Here is how RAM Disk Mover works:

- 1. First it looks for the PROGRAMS subdirectory on your floppy disk. If PROGRAMS is not found, RAM Disk Mover instructs you to insert another disk.
- 2. Next, it looks in the RAM drive for the PROGRAMS subdirectory. If PROGRAMS is not found, RAM Disk Mover creates the subdirectory. If PROGRAMS is found, it deletes all of the files in PROGRAMS. This makes room for the new programs.
- 3. RAM Disk Mover goes back to the floppy PROGRAMS subdirectory. Then it saves the name and length (in blocks) of each BASIC program. It stops when there are no more BASIC programs or when the number of blocks exceeds the capacity of the RAM drive (118 blocks, considering the directories).
- 4. Using this list of BASIC programs, RAM Disk Mover builds an EXEC file containing a series of LOAD and SAVE commands. The EXEC file is named TEMP.EXEC and is stored in the volume directory of the floppy with which RAM Disk Mover is currently working.
- 5. RAM Disk Mover adds a RUN command as the last line of the EXEC file. The program specified by the variable P1\$ will start automatically when the copy operation is

finished. Right now, P1\$ is set up for STARTUP.RAM. You can change this to whatever program name you want.

6. After building the EXEC file, RAM Disk Mover clears the screen and informs you that all is well. Then the EXEC file starts up. At this point, programs are actually moved from floppy disk to RAM disk. Your startup program will run and you'll be in business.

Preparing The Mover

RAM Disk Mover requires little, if any, of your attention while it runs. Your biggest job is to organize your disks so that Mover can access them properly.

Here are some guidelines for trouble-free operation:

Format some disks so you'll always have some spares handy. Use whatever volume labels suit you.

As you format the disks, be sure to establish the PROGRAM and DATA subdirectories.

Place a copy of Mover in the volume directory of each disk. Mover does not require much space.

Place all of the BASIC programs you want Mover to copy in the PROGRAMS subdirectory. Don't forget that the RAM disk has a limit of about 61K or 120 blocks. If you think you will exceed this limit, place some of the programs on a second disk.

Putting It To Work

Now for the actual operation. It's simple:

- 1. Always make sure your IIc is turned on, that ProDOS is ready, and that you're in Applesoft.
- 2. Place your program disk in the internal disk drive.
- 3. Type either RUN MOVER or -MOVER. RAM Disk Mover will take over from there. It tells you the name of each program it is copying, then starts the EXEC file. As the EXEC file runs, you will see a series

of open brackets displayed. This means all is well.

- 4. When the EXEC file is done, the STARTUP.RAM program will begin running if it is present.
- 5. At this point, you can remove your floppy disk from the disk drive. You can insert a data disk and have the entire 140K free for data storage.

Now What?

RAM Disk Mover has done its job. The BASIC programs have been moved over to the RAM disk. Now, how do you get to the programs?

If you want to run a program, you can type:

RUN /RAM/PROGRAMS/programname

r

- /RAM/PROGRAMS/program-name

Perhaps typing all this seems a bit tedious. You can use the PREFIX command:

PREFIX /RAM/PROGRAMS

Now whenever you want to run a program, you can just type RUN followed by the program name. /RAM/PROGRAMS/ is automatically appended to the front of the name.

A caution is in order, however. Suppose that your program performs some file operations. If the input/output statements do not include a full path name, the prefix will also be applied to your data file commands. This will cause your program to try to read or write to the RAM disk—probably not what you intended. Remember this when using the PREFIX command.

You can also use the usual LOAD and SAVE commands, of course. But this time a warning is in order. Yes, you can recall a program from the RAM disk, work on it, test the revisions, and store it back in the RAM disk. Just don't forget it's only a RAM disk. If the power goes kaplooey, then your program goes kaplooey along with it. If you make important changes to a program,

save the new version on a real live disk. The RAM disk is best for programs you just want to run.

Oops!

On occasion things can go wrong—especially where computers are concerned. Here are a few gotchas. Watch out for them.

- RAM Disk Mover is designed for an Apple IIc and ProDOS. It uses the 80-column display capability of the IIc. If the display looks funny, make sure your computer is in the 80column mode.
- Mover attempts to use all of the available RAM drive space. It will clean up /RAM/PROGRAMS, but it is not aware of anything else that you may have in the RAM drive. If you run out of room, ProDOS will tell you about it loudly and clearly.
 There can be problems writing the EXEC file. Do not remove your program disk until RAM Disk Mover is finished with it. Do not write-

protect it, either. Finally, leave a few

blocks free for Mover's use. That

EXEC file has to go somewhere.

Additional Hints

Programs can run other programs. If the programs are in the RAM disk, switching from program to program is almost instantaneous. Here's an example:

10 REM PROGRAMI

2Ø D\$=CHR\$(4)

3Ø PRINT "PROGRAM 1 IS RUNNING"
4Ø PRINT D\$;"-RAM/PROGRAMS/PROG
RAM2"

10 REM PROGRAM2

2Ø D\$=CHR\$(4)

30 PRINT "PROGRAM 2 IS RUNNING"

4Ø PRINT D\$;"-RAM/PROGRAMS/PROG

How about that! Keep this technique in mind when you are writing that huge program that eats all the available program space. The way out is to think small and think RAM drive. ProDOS even has a CHAIN statement that permits variables to be passed between programs.

If you would like to learn more about ProDOS, find a copy of Apple's BASIC Programming with ProDOS. It covers all the ProDOS features available from Applesoft

BASIC.

Apple IIc RAM Disk Mover

100 REM MOVE /.../PROGRAMS TO / RAM/PROGRAMS (MOVER) 110 REM 120 PF\$ = "/RAM/PROGRAMS/" 13Ø P1\$ = "STARTUP.RAM" 14Ø RB = 118: REM /RAM BLOCKS A VAILABLE 15Ø MP = 50: REM MAX PROGRAMS

160 DIM PN\$ (MP)

170 HOME :D\$ = CHR\$ (4): PRINT

D\$;"PR#3" 180 GOSUB 330: REM TITLE 190 GOTO 400: REM OPEN DIRECTOR

200 GOTO 650: REM CREATE /RAM D IRECTORY

210 GOSUB 860: REM MOVE PROGRAM

22Ø REM

230 REM THE EXEC PROGRAM WILL M OVE THE PROGRAMS

24Ø REM

25Ø HOME

260 VTAB 12: HTAB 1: PRINT "Run ning the EXEC copy program

270 FOR I = 1 TO 1000: NEXT 280 PRINT D\$; "EXEC "; FL\$

29Ø HOME

300 VTAB 12: HTAB 1: PRINT "Pro grams are being copied to:" ;PF\$

310 FOR I = 1 TO 1000: NEXT 320 END

330 REM PROGRAM TITLE

340 UL\$ = "": FOR I = 1 TO 80:U L\$ = UL\$ + " ": NEXT

350 TL\$ = "DISK TO /RAM PROGRAM MOVER"

360 HOME : VTAB 1: HTAB 1: PRIN T UL\$

370 VTAB 3: HTAB (80 - LEN (TL\$

)) / 2: PRINT TL\$ 38Ø VTAB 4: HTAB 1: PRINT UL\$

39Ø RETURN

400 REM OPEN /.../PROGRAMS DIRE

410 GOSUB 590: REM GET VOLUME L ABEL

42Ø DR\$ = VL\$ + "PROGRAMS/"

430 VTAB 6: HTAB 1: PRINT "Movi

44Ø ONERR GOTO 48Ø

450 PRINT D\$; "OPEN "; DR\$; ", TDIR

460 POKE 216,0: REM NORMAL ERR

47Ø GOTO 2ØØ

480 POKE 216,0: REM NORMAL ERR

490 CALL - 3288: REM FIX STACK 500 VTAB 8: HTAB 1: PRINT "The directory '/PROGRAMS/' is n

ot on the diskette ";VL\$ 510 VTAB 10: HTAB 1: PRINT "Ins

ert the proper diskette."
520 VTAB 12: HTAB 1: PRINT "Pre
ss SPACE to continue. Pres
s RETURN to stop."

530 GET C\$: IF C\$ < > " " AND C \$ < > CHR\$ (13) THEN 530

540 FOR I = 6 TO 12 STEP 2 550 VTAB I: HTAB 1: PRINT SPC(79); CHR\$ (13)

56Ø NEXT

57Ø IF C\$ = CHR\$ (13) THEN STOP

58Ø GOTO 4ØØ

590 REM GET VOLUME LABEL

600 PRINT D\$; "PREFIX /"
610 PRINT D\$; "PREFIX"

62Ø INPUT VL\$

63Ø PRINT D\$

64Ø RETURN

650 REM CREATE /RAM/PROGRAMS/ 660 VTAB B: HTAB 1: PRINT "Movi

ng programs to ";PF\$ 67Ø ONERR GOTO 82Ø

680 PRINT D\$; "OPEN "; PF\$; ", TDIR

690 PRINT D\$; "READ "; PF\$
700 INPUT L1\$

71Ø INPUT L2\$

72Ø INPUT L3\$
73Ø INPUT L4\$: IF L4\$ = "" THEN

740 T\$ = MID\$ (L4\$, 2, 15)

750 NP = NP + 1:PN\$(NP) = T\$

76Ø GOTO 73Ø

770 PRINT D\$; "CLOSE "; PF\$

78Ø FOR I = 1 TO NP

790 PRINT D\$; "DELETE "; PF\$; PN\$(
I)

800 NEXT

810 GOTO 210

820 POKE 216,0: REM DIRECTORY N OT PRESENT

830 CALL - 3288: REM FIX STACK

840 PRINT D\$; "CREATE "; PF\$

850 6010 210

860 REM MOVE PROGRAMS

870 NP = 0: REM NUMBER OF PROGR AMS

880 BC = 0: REM BLOCK COUNT

890 PRINT D\$; "READ "; DR\$

900 INPUT L1\$: REM DIRECTORY NA

910 INPUT L25: REM TITLE LINE

920 INPUT L3\$: REM BLANK LINE 930 INPUT L4\$: REM FILE ENTRY

940 IF L4\$ = "" THEN 970

950 GOSUB 1000: REM SAVE PGM NA MES

96Ø GOTO 93Ø

97Ø PRINT D\$; "CLOSE"

980 GOSUB 1160: REM BUILD EXEC

99Ø RETURN

1000 REM SAVE PGM NAMES

1010 IF MID\$ (L4\$,18,3) < > "BA S" THEN 1150

1020 NP = NP + 1

1030 IF NP > MP THEN 1150

1040 BC = BC + VAL (MID\$ (L4\$, 23,6))

1050 IF BC > RB THEN 1150

1060 T\$ = MID\$ (L4\$,2,15)

1070 FOR K = 15 TO 1 STEP - 1 1080 IF MID\$ (T\$,K,1) < > " " T

HEN 1100 1090 NEXT

1100 PN\$ (NP) = LEFT\$ (T\$,K)

1110 IF PN\$(NP) = P1\$ THEN SU =

1120 VTAB 10: HTAB 1: PRINT SPC (79); CHR\$ (13)

1130 VTAB 10: HTAB 1: PRINT "Co

pying ";PN\$(NP);" ..."
1140 FOR K = 1 TO 500: NEXT
1150 RETURN

1160 REM BUILD EXEC FILE

1170 VIAB 10: HTAB 1: PRINT SPC (79); CHR\$ (13)

1180 VTAB 10: HTAB 1: PRINT "Bu ilding EXEC copy program .

1190 FL\$ = "TEMP.EXEC"

1200 PRINT D\$; "OPEN "; FL\$

1210 PRINT D\$; "CLOSE "; FL\$
1220 PRINT D\$; "DELETE "; FL\$

1230 PRINT D\$; "DELETE "; FL\$

1240 PRINT D\$; "WRITE "; FL\$ 1250 FOR I = 1 TO NP

1260 PRINT "LOAD "; VL\$; "PROGRAM S/": PN\$(I)

1270 PRINT "SAVE ";PF\$;PN\$(I) 1280 NEXT

1290 IF SU = 1 THEN PRINT "-";P

1300 PRINT "PRINT: PRINT" 1310 PRINT D\$; "CLOSE"

1320 RETURN

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Commodore Disk Editor

Martin Sikes

Examine or edit any sector on a disk with this short, useful program for the Commodore 64 and 1541 disk drive. Recommended for intermediate to advanced users.

One of the best ways to learn about disk storage is to look at the actual contents of sectors on the disk. "Commodore Disk Editor" lets you do just that and even change the contents if you wish. Equipped with this tool, you can repair garbled disks, retrieve accidentally scratched files, as well as protect your programs against tampering by others.

To make the most of Disk Editor, you'll need to know at least the basics of Commodore disk storage. Consult your 1541 User's Manual. Additional information also is available in various books and programming guides. Even without advanced knowledge, however, you can perform some interesting tricks. A few examples are given below.

To get started, type in the program and save it. When running it for the first time, put an unimportant disk in the drive. Making mistakes with a program like this can scramble a disk and render it useless. Until you have gained some experience, practice on an unimportant disk. Make a backup copy of any important disk before you try to alter it.

Reading And Editing Blocks

Disk Editor begins by prompting you to enter track and sector numbers of the block of data you want to examine. Commodore 1541 disks have 35 tracks, and each track contains a number of sectors. (The terms *sector* and *block* are often used interchangeably to describe a 256-byte data area on the disk.) The available track and sector numbers are listed below. Tracks 1–17 each have 21 sectors, numbered 0–20, and so on.

Tracks	Sectors	
1-17	0-20	
18-24	0-18	
25-30	0-17	
31-35	0-16	

To choose a particular sector, you must enter two numbers separated by a comma. The program does not let you enter nonexistent track or sector values, with the exception noted below. For example, enter 18,1 and press RETURN to examine track 18, sector 1 (this block holds the first part of the disk directory). Disk Editor reads that block from the disk and displays its contents at the top of the screen.

Disk Editor displays the block using the upper-/lowercase character mode. Thus, the values on the screen correspond to the numbers in your 64 User's Guide screen code table: A zero is displayed as an @ character, 13 as a lowercase m, and so on.

The next prompt asks whether you want to edit the block displayed on the screen. Press Y to edit, or N to choose another sector. If you select Y, press the cursor keys to move the blinking cursor atop the character you want to change. Then type in the new character over the old one. For instance, if the first filename in your directory is DOG, you can change the name to BOG simply by typing SHIFT-B over the D.

When your editing is complete,

you again have two options. You can press RETURN to write the changed block back to the disk, or press the f1 special function key to escape the editing mode without changing anything on the disk. In either case, you'll return to the first prompt, so you can read the same sector again to verify your changes or proceed to another sector. To exit the program, enter track 99, sector 99 at the first prompt. These are the only nonexistent track and sector numbers that Disk Editor allows you to enter.

Don't Boggle The BAM

You've already seen how to change filenames by editing directory blocks. The disk name can be changed just as easily, by editing track 18, sector 0. Note that these names cannot be more than 16 characters long.

Sector 0 of track 18 contains the Block Availability Map, or BAM—important information about the organization of programs on the disk. It's very easy to damage files by improperly changing things in this sector. Until you're familiar with the BAM, avoid changing anything in this sector other than the disk name.

You may notice that a copy of the disk ID follows the disk name in the BAM. However, you cannot change the disk ID by changing this value in the BAM. (You can change the value of the ID shown in sector 0, but this won't change the disk ID; there's no way to do that without reformatting the disk.)

Hidden Programs

Lots of tricks are possible with Disk Editor. Perhaps you'd like to conceal a program's name to make it difficult for others to find in the