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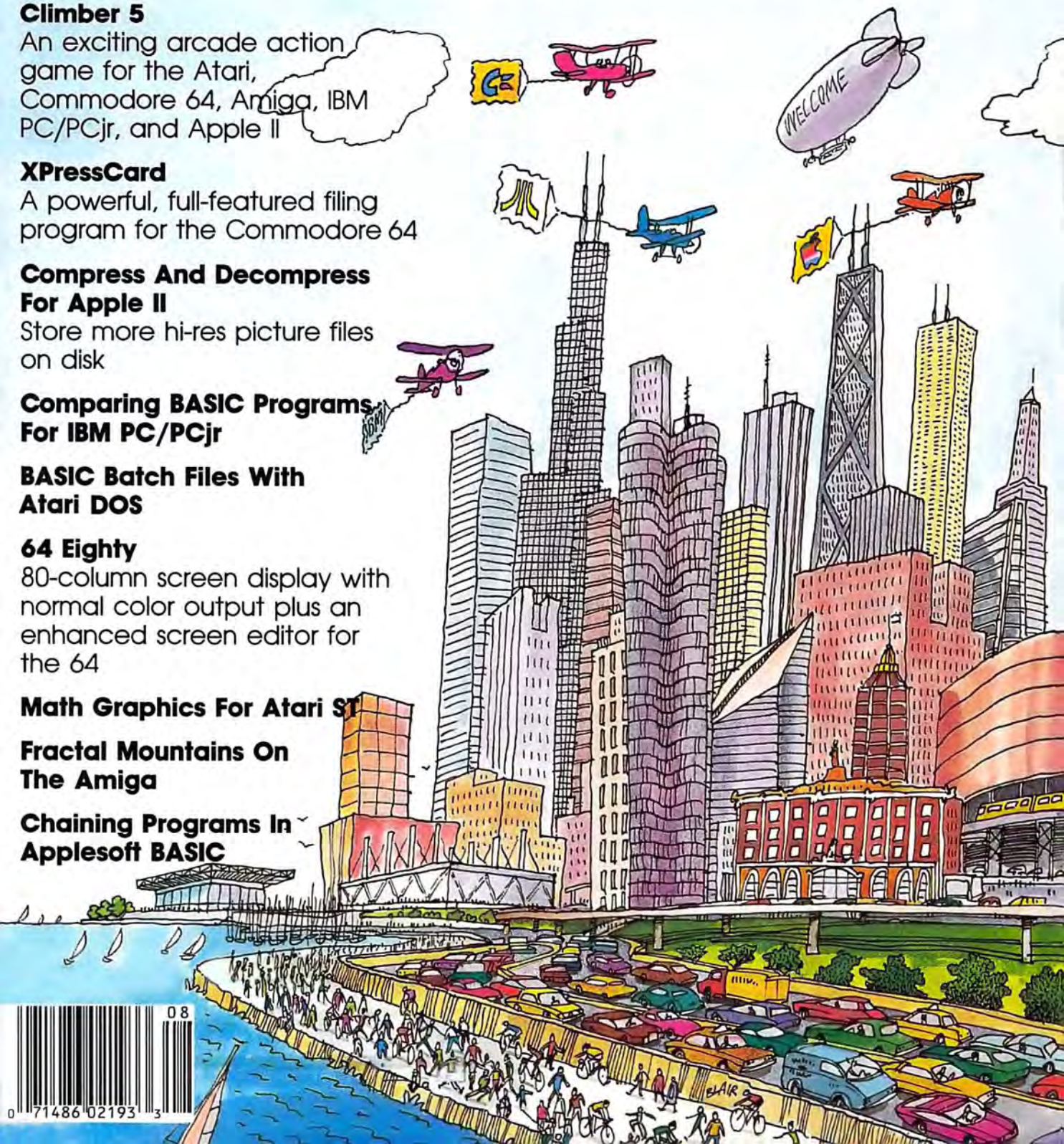

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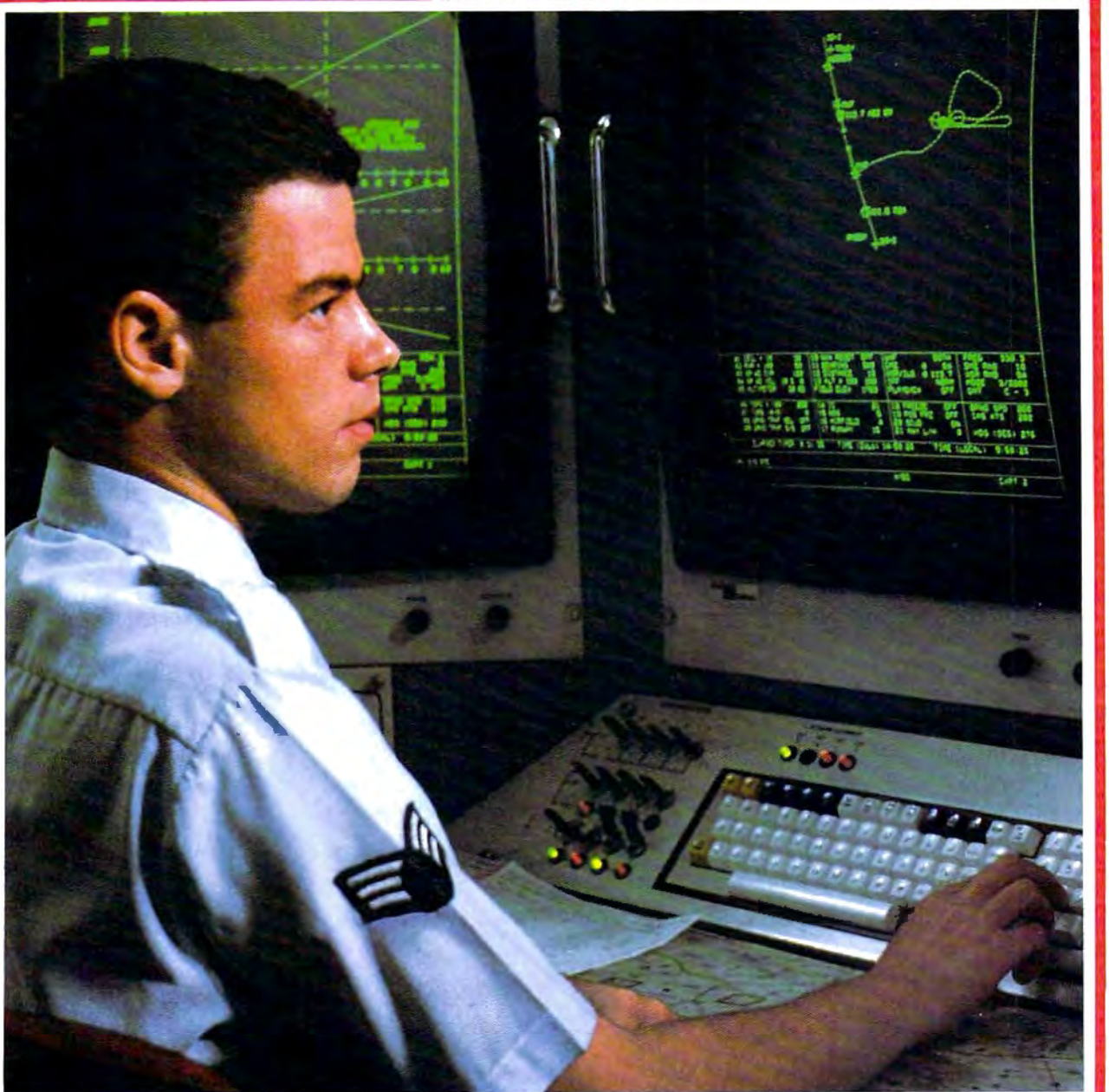

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Editor's Notes

Recent important breakthroughs in a technology called superconductivity *promise major advances in several fields. COMPUTE!'s Technical Editor, Ottis Cowper, explains the implications for computers in this guest editorial. —Richard Mansfield*

Computer designers, like race-car designers, are constantly seeking ways to make their machines run faster. The faster a computer operates, the more information it can process in a given amount of time; hence, the more effective and powerful it is.

Information is stored and manipulated within a digital computer as collections of electronic pulses, so the fundamental speed limit for information flow is the speed at which electricity flows through the computer's circuitry—approximately the speed of light. However, there are a number of reasons why computers achieve only a fraction of this theoretical speed.

One limitation is inherent in the integrated circuit chips that make up the computer. These chips contain thousands of tiny electronic switches called *gates*. The gates can't switch off and on instantaneously; it takes a certain amount of time for a signal to make it through a gate. The more gates a signal has to flow through, the more delays it will encounter. In even the simplest of computers, a pulse may pass through dozens, or even hundreds, of gates between input and output, with each gate delaying the pulse a bit more.

The easiest way to make a given electronic gate switch faster is to operate it at a higher power, but this introduces other problems. At higher power, each gate must dissipate more energy as it is switched off or on—energy dissipated in the form of heat. High power can yield high speeds, but it can also cause chips to overheat and break down. This is especially a problem in high-density integrated circuits, which may pack 100,000 gates on a single chip.

Another way to improve computer speed is to construct chips from a material that switches faster at a given power level. Typical gate delays in silicon, the material most commonly used in computer chips, are measured in tens of nanoseconds (a nanosecond is 10^{-9} second, one-billionth of a second). That might sound unimaginably fast, but in electronic terms, a nanosecond is a long time. An electrical pulse could travel 30 feet through a wire during the 30 nanoseconds spent waiting for a silicon gate to switch.

Currently being studied as an alternative to silicon as a semiconductor material is gallium arsenide (GaAs). A gate fabricated in GaAs can operate with a delay 100 times less than that of the equivalent silicon gate. Typical gate delays in gallium arsenide are measured in hundreds of picoseconds (a picosecond is 10^{-12} second, one-trillionth of a second). However, for even faster speeds, a totally new technology is needed.

In the early 1960s, researcher Brian Josephson proposed a new type of gate, which later bore his name. A Josephson junction can operate (switch) in a picosecond or less, much faster than any other gate, even one made from gallium arsenide. However, even though the Josephson junction has been around for 20 years, it made its appearance in commercially available hardware only in the past year. The problem with developing practical Josephson junction devices is that they can be fabricated only from *superconducting* materials.

Superconductors were discovered in the early 1900s, when a Dutch researcher found that some common metals suddenly take on radically different properties when cooled to near absolute zero. (*Absolute zero* is 0° on the Kelvin temperature scale used by physicists; it's equivalent to −459° Fahrenheit.) The most notable property of a superconductor is that it exhibits essentially *no* resistance to the flow of electric current. (Superconductors have some unusual magnetic effects as well.)

For years, researchers have sought materials that would become superconducting at warmer temperatures. Until recently, the results weren't encouraging. The "warmest" superconducting alloy still required a temperature of about −420°. To achieve and maintain such low temperatures, the materials had to be immersed in liquid helium or liquid hydrogen, which is very expensive. Under these conditions, superconducting gates weren't practical for computing applications.

The past few months, however, have seen an avalanche of breakthroughs. Just a few weeks ago there was the astonishing announcement of the discovery of a material which superconducts at a balmy 9° F, a temperature well within the capabilities of conventional refrigeration equipment. Many researchers now believe that room-temperature superconducting materials are possible, and that the discovery of such materials is imminent.

At these temperatures, superconductors—and chips with blindingly fast Josephson-junction integrated circuits—can make the transition from the laboratory into practical applications. For example, freed from extreme power and cooling requirements, today's mainframe supercomputers could shrink to desktop size, with corresponding reductions in cost. This would bring the tremendous computing power of these machines to far more users, paving the way for breakthroughs in areas such as artificial intelligence, where the processing speed of the current generation of desktop computers is a major bottleneck.

We can expect to hear more about superconductors in coming months. This rapidly expanding technology has applications in areas other than just computers. For example, superconducting materials can be used to make extremely powerful electromagnets. A number of states are currently competing to house the Superconducting Supercollider, a federally funded project that promises to open new frontiers in high-energy physics. Using superconducting magnets, this unit will produce energy levels far in excess of those in existing accelerators, allowing scientists to probe deeper into the arcane world of subatomic particles. And superconducting magnets may make practical the proposed high-speed *maglev* (magnetic levitation) trains, which float just above their tracks on a powerful magnetic field. It appears that the superconductor will be one of the next high-tech items to make the leap from research labs into our everyday lives. ©

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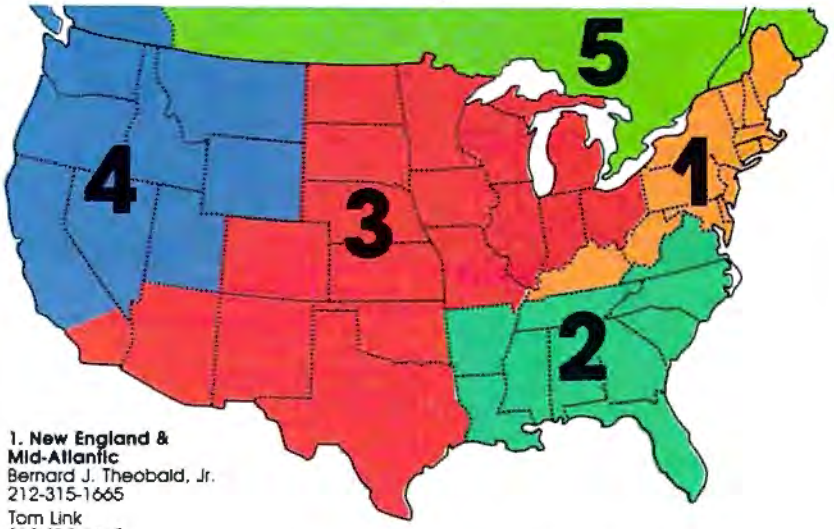

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Whither The 5¼ Floppy?

I read a newspaper article stating that the production of 5¼-inch floppy disks will be halted. Is this true?

Richard LaBorde

Many computer manufacturers have begun to include 3½-inch disk drives as standard equipment. Recent examples include the IBM Personal System 2 family, Amiga, Apple Macintosh, Atari ST, and a number of IBM PC compatibles. You can also buy add-on 3½-inch drives for the Apple II or the Commodore 64 and 128. But this doesn't mean that 5¼-inch floppy drives or disks are dead. Many recent introductions, such as the Compaq Portable III and Epson Equity I+, include 5¼-inch drives. And there are over 10 million 5¼-inch disk drives in use at this time—far too big a marketplace factor to be abandoned overnight.

What's happening is a gradual process of transition that will certainly take years. Recognizing the new demand for 3½-inch disks, some software manufacturers have begun supplying their programs in both formats—either in a "double pack" containing disks of both formats, or by giving buyers the option of 5¼- or 3½-inch disks. It's likely that more new computers will use 3½-inch disk drives, and some suppliers of 5¼-inch disks and drives may decrease production as demand slows. However, you should be able to find 5¼-inch disks long into the future. Take the case of 8-inch disks: Few if any new computers come with an 8-inch drive these days, but 8-inch disks are still readily available.

Caps Control For 130XE

I have been reading your magazine for several years and I enjoy it a lot. At present, I'm doing some programming on an Atari 130XE. Would you tell me the correct PEEK to check the status of the Caps key?

Robert A. Engle

Location 702 reflects the status of the Caps key on all Atari eight-bit models. This location contains a zero if the keyboard is in lowercase mode, and 64 if the keyboard is in uppercase mode. The values in this location are always current when you're in immediate mode; when running a program, location 702 is updated only after you execute a GET or an INPUT statement. By POKEing a zero or 64 into location 702, you can change the keyboard status under program control.

Why Save First?

I am a new computer user, and I'm confused about something I read in your magazines. You often say *Save a copy of the program before you run it.* I find that I can run a program and save it later if I like the program. Could you please explain why it's important to save first?

John Huda

In most cases, it is possible to save a BASIC program after you've run it. However, some programs modify or delete parts of themselves when they are run. If you save at that point, you may not get the entire program. Other programs POKE a machine language program into memory. If you've mistyped even one number in the machine language portion, the computer may lock up, requiring you to turn the machine off and back on to regain control. Whenever you turn off the power, you lose whatever was previously in the computer's memory. To avoid losing your work by accident, it's always a good idea to save a program before *you try it out for the first time.*

Upgrading Amiga's Processor

I am writing with reference to your hands-on report about the new Amiga 2000 computer in the March, 1987 issue. I am a satisfied owner of an Amiga 1000, and I think my computer can do just about all the things the Amiga 2000 can do—albeit not as conveniently. I can add extra memory and run IBM PC software with the aid of the Sidecar peripheral. However, I am not sure about one point. Can the Amiga 1000 upgrade to a Motorola 68020 microprocessor and/or 68881 numeric coprocessor as the Amiga 2000 can?

Nathan Singer

Both the Amiga 1000 and 2000 come with the same Motorola 68000 microprocessor as standard equipment. On either machine, you should be able to unplug the 68000 chip and replace it with the somewhat more powerful 68010 chip. This operation has been done by some Amiga 1000 owners, gaining a slight increase in performance. Note, however, that replacing the chip voids your warranty and should not be attempted unless you have plenty of electronics experience.

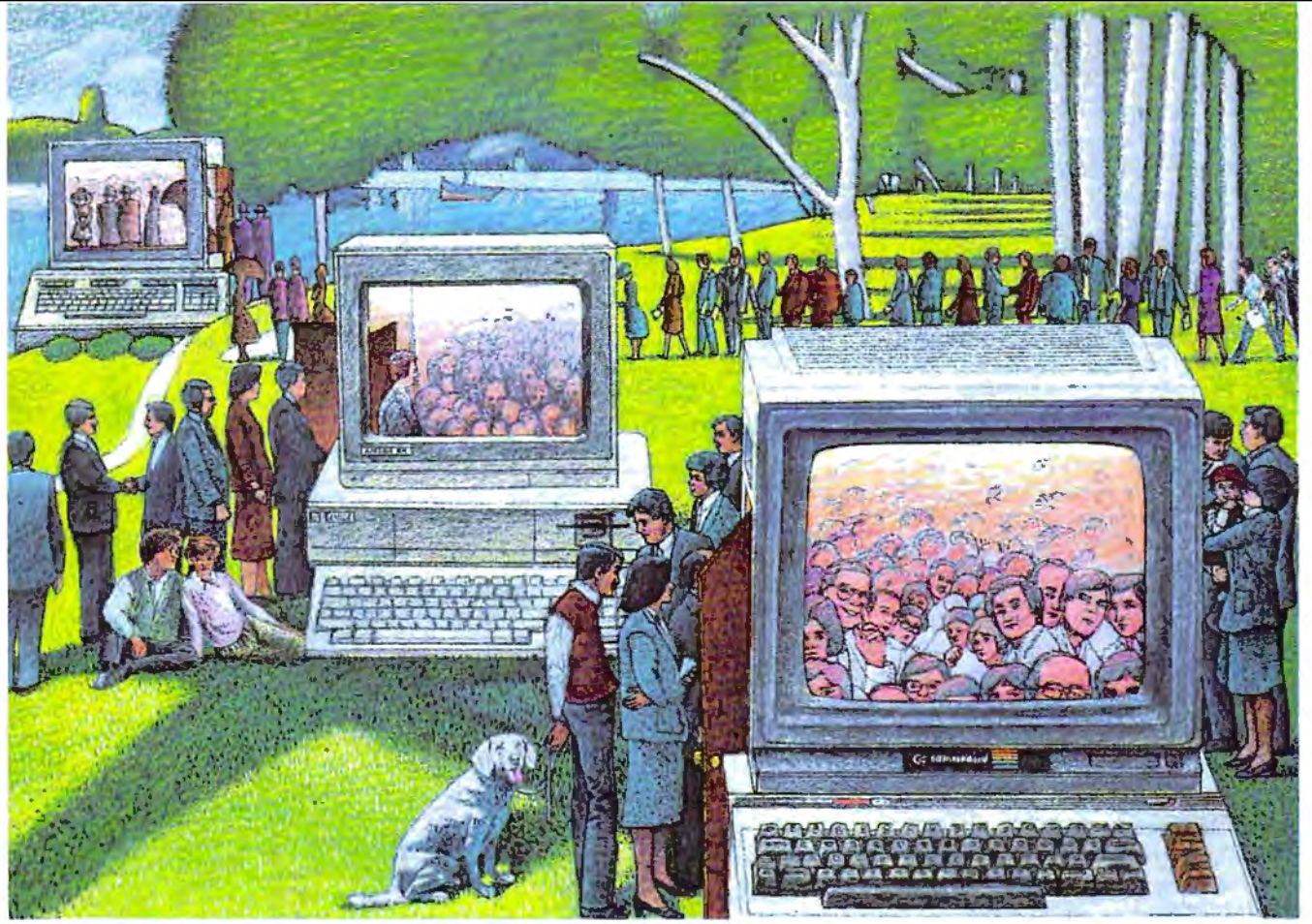
Unlike the 68010 chip, the 68020 processor is not plug-compatible with the 68000. You can't just pull out the 68000 and pop in a 68020 because the 68020 has a different shape and pin layout. A 68881 math coprocessor is a separate chip which would have to go in its own socket, too. There are no built-in sockets for either the 68020 or 68881 chips in any Amiga model. No matter what Amiga you own, you will need some sort of expansion board to upgrade to a 68020 microprocessor or to install a 68881 math coprocessor. For the 2000, this board (when it becomes available) will plug into one of the computer's built-in expansion slots. On the Amiga 1000, you must also buy an external expansion box, since no expansion space is provided inside the computer.

One company that sells a 68020 upgrade board for the Amiga 1000 is Computer System Associates, 7564 Trade St., San Diego, CA 92121. Prices for these chips are quite high; you can expect to pay over $1,000 dollars for a board containing both a 68020 and 68881. However, you can expect prices to drop as Motorola increases production of these items.

Commodore Monitor Commands

I have been trying to teach myself to program in machine language, but I haven't been able to figure out how to get my monitor to save the programs I write. I am using a program called "Supermon 64."

Cliff Anderson



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All Commodore machine language monitor programs use similar commands for saving, but the syntax differs slightly from one monitor to the next. Say that you want to save a program that occupies memory locations $C000–$C020. Here is the syntax to use from "Supermon 64:"

```
.S "TEST",08,C000,C021
```

(The monitor program supplies the period at the beginning of the command; you type the rest.)

Of course, you would substitute your filename for TEST. The S command stands for Save, and the name inside quotation marks can be any legal Commodore filename. After the filename come three parameters: the device number (use 08 for disk, 01 for tape), the starting address, and the ending address. Notice that the ending address is actually one byte beyond *the last byte that you want to save. This peculiarity is common to most Commodore monitors. If you are using the Commodore 128's built-in machine language monitor, the syntax of the save command is the same, except that commas are not needed and you need not put a leading zero in front of the 8.*

Here's the syntax for saving the same program using "Micromon," another popular Commodore 64 monitor:

```
.S C000 C021 "TEST" 08
```

All the same parameters are present, simply in different order. Whereas Supermon 64 insists that the last four parameters be separated by commas, Micromon expects them to be separated by spaces. Other monitors may use a slightly different syntax.

To load a file, you need only specify the filename and device number. Here is a typical monitor load command:

```
.L "TEST",08
```

Again, some monitors may expect to see the device number in front of the filename, or they may insist on a space where the comma appears. Note that all loads from a monitor are nonrelocating: The data goes into the same memory area it was originally saved from.

Another useful trick is knowing how to divert the monitor's output to a disk file or to a printer. If you're examining a long program, for instance, it's much easier to deal with a printed disassembly rather than a disassembly on the screen. The printout lets you see more than one screenful of information at a time and can also be annotated with comments.

A few monitors provide a separate command for printer output (typically, P) or one for generally diverting output (typically, O). Supermon and Micromon don't support printer output or general diversion, but there's still a way to accomplish the job. To illustrate, say that you are using Micromon, which starts at location 49152, and you want a printed disassembly of the first 32 bytes of the program, in locations $C000–$C020. After loading Micromon and performing a NEW, you could enter these commands and press RETURN:

```
OPEN 4,4:CMD 4
```

The OPEN statement opens a file to the printer (device 4) and the CMD statement diverts to the printer all output that would normally go to the screen. You'll have to type blind, for the most part: When you enter Micromon, you won't see the program's normal display, but characters which you type will still appear on the screen. Enter this command to start Micromon:

```
SYS 49152
```

If you are using Supermon and have previously installed it at its normal location, you would substitute SYS 38893 for the preceding command. In either case, you are now in the monitor; the program's normal register display goes to the printer rather than appearing on the screen. This command disassembles the bytes in locations $C000–$C020:

```
.D C000 C020
```

The printer prints a disassembly of those bytes and waits for your next command. Exit the monitor with X and then enter this statement to close the file to the printer:

```
PRINT#4:CLOSE 4
```

The naked PRINT# statement is needed to insure that all printer output gets sent to that device. The resulting printout will contain a couple of superfluous READY statements in addition to the output from the monitor. Remember, CMD causes all *output to be diverted, even BASIC prompts and error messages.*

You can divert the monitor's output to a disk or tape file with the same technique. Just open the file before you enter the monitor. This session shows how to send a Micromon disassembly of the bytes in locations $C000–$C020 to a disk file named TEST:

```
OPEN 2,8,2,"0:TEST,P,W":CMD 2
SYS 49152
.D C000 C020
.X
PRINT#2:CLOSE 2
```

Again, you must take care to close the file properly after exiting the monitor. The same method works with Supermon 64; however, you should not start Supermon with RUN after opening the disk file, since RUN has the effect of closing all disk channels (although it doesn't properly close all open files). If you have not yet run Supermon, start it with GOTO 130 rather than with RUN. If it's already installed, restart it with SYS 38893. In much the same way, you can divert the output of other monitor commands such as M (Memory) and R (Registers) that normally print information on the screen.

Supermon 64 and Micromon are both public domain programs, available from many Commodore user groups and other public domain sources. Supermon 64 is also included in Raeto West's Programming the 64, *available from COMPUTE! Books.*

Connecting To A VCR

I own an Atari 800XL. Is there any way I could hook my computer to a video cassette recorder (VCR)?

Rodney Santiago

Yes. There are two ways to do this. The simplest is to connect the antenna leads on the switchbox supplied with the computer (which are normally used to connect the computer to a television) to the VHF antenna inputs on the VCR. The other way is to make a special cable to connect the computer's monitor port directly to the video-in port of the VCR. If you aren't comfortable making a cable like this, a local television repairman may be able to make one for you. Your computer manual should explain the pinout, or connections, on the computer's video port.

Line Lengths In Commodore BASIC

I am planning to buy a 128. I recently typed in a program line for the 128 on my 64 and exceeded the two-line limit. This caused a syntax error when I pressed RETURN. Does this mean I need an 80-column monitor to type in programs for the 128?

John Gacis

The maximum length of a BASIC line has nothing to do with what type of monitor you're using. The controlling factor is the size of the input buffer, where program lines are processed after entry. The 64 has an input buffer of 80 characters, which is why you're limited to no more than two 40-column lines for any BASIC line typed on a 64. The 128 has an input buffer 160 characters long. On a 40-column monitor, a single BASIC program line can span up to four lines. On an 80-column monitor, only two lines are filled, but the line-length limit is the same regardless of the monitor.

Easy Language Drill

I am studying a foreign language. I want to be able to display the foreign language word and, after a delay of a few seconds, have the English equivalent appear. The foreign language words should appear in a different order each time the program is run.

Don Moschenross

The following short program will work without modification in BASICA on the IBM PC/PCjr, Microsoft BASIC for the Amiga or Macintosh, ST BASIC, and any version of Commodore BASIC. The program displays Spanish and English words; to drill in another language, simply substitute the appropriate words in the DATA list at the end of the program. You can also add more word pairs; change the DIM statement in line 110 to match the number of word pairs you wish to use. Different versions of BASIC run at different speeds; if you find that the delay is too short, increase the number 2000 in lines 250 and 270.

```
FE 100 REM array size is number
       of words
HP 110 DIM EN$(3),SP$(3)
DO 120 REM -1 is the last data i
       tem
HC 130 READ ENGLISH$,SPANISH$
CB 140 IF ENGLISH$="-1" THEN 180
FP 150 EN$(N)=ENGLISH$:SP$(N)=SP
       ANISH$
CC 160 N=N+1:GOTO 130
IF 170 REM generic randomizer
FB 180 INPUT "Enter a number bet
       ween 1 and 9999";X
FL 190 FOR J=1 TO X:T = RND(1):N
       EXT
AC 200 I=INT(RND(1)*N)
KJ 210 IF NR=N THEN PRINT"all th
       e words in the list have"
       :PRINT"been displayed.":E
       ND
DK 220 IF T(I)=1 THEN 200
HK 230 PRINT" Spanish :  ";SP$(I
       )
BL 240 REM delay loop
KD 250  FOR J=1 TO 2000:NEXT J
DB 260 PRINT"   English :  ";EN$
       (I);
JI 270 PRINT:FOR J=1 TO 2000:NEX
       T J
MJ 280 T(I)=1:NR=NR+1:GOTO 200
OK 290 DATA dog,perro, cat,gato,
        door,porta, one,uno, -1,
       -1
```

Atari Modem Fix

Atari's XM301 modem is an excellent buy for the money. However, there is a serious problem with the wiring that everyone should be aware of. Of the 13 wires coming from the serial input/output cable, only nine wires are actually used by the modem. The remaining four wires do nothing. Inside the modem, these four wires have approximately ⅛-inch of bare wiring exposed with no insulation. If they short out, they can damage one or more pieces of equipment daisy-chained in your computer system. This problem has been widespread in the Albany area, and it has been discovered in other areas as well.

To fix the problem, begin by unplugging the modem from your computer (this disconnects the power). Remove the two screws from the bottom of the modem and snap apart the plastic case. Carefully locate and cut off the four unconnected wires, making sure that the pieces don't fall inside the modem and that you don't cut any other wires. Cover each of the wires with electrical tape if you can, or at least make sure the wires don't touch each other and are covered with a single piece of tape. Then reassemble the modem and enjoy it safely.

Joseph Pasquini

Before receiving your letter, we had read about this potential problem in an Atari user-group newsletter and immediately checked an XM301 modem to see if it was true. The four bare wires were easy to find, and the fix took less than five minutes. Although our particular modem has been used for more than a year with no trouble, it's not hard to envision how the bare wires could cause a short-circuit under the right conditions. Thanks for the tip. However, since your suggestion does involve opening the modem case and cutting wires, we must remind readers that they perform this modification at their own risk. Opening the case may void the warranty, and cutting the wrong wire could make the modem nonfunctional. Anyone who has any doubts should refer the job to someone with more technical experience.

Hi-Res Multicolor Characters On The 128

In high-resolution multicolor mode, the 128's CHAR command prints strange looking *I*'s, *J*'s, and *O*'s. I thought that a way to avoid this problem would be to print small characters. However, CHAR will not print lowercase letters on the multicolor hi-res screen. Is there a POKE I could use to switch the case? PRINT CHR$(14) does not work.

John M. Boyer

In multicolor mode, the screen can display twice as many colors, but you make a sacrifice: the horizontal resolution is cut in half. The width of the hi-res multicolor screen is 160 double-width pixels instead of 320. Character shapes are four double-width pixels by eight instead of the usual eight by eight.

One solution that seems to work well is to use lowercase letters instead of capitals. The control code CHR$(14) will work, but you must include it within the CHAR statement itself instead of PRINTing it. Try this:

```
CHAR 1,5,5, CHR$(14)+"XYZ"
```

Commodore Speed Limits

I have owned a Commodore 64 computer along with many peripherals for several years. I am happy with my system; however, I have been trying for some time to speed up my machine. From what I understand, the 6510 microprocessor comes in two versions, 1 MHz and 2 MHz. The version in the 64 is the 1 megahertz (MHz) type. Would it be possible to just pull out the old 6510 and replace it with a 2 MHz chip? Would this cause problems with the VIC-II video chip? Any information you can give me regarding possible circuit changes or kits available to do this would be greatly appreciated.

Ed Federmeyer

First of all, the microprocessor itself does not control the speed at which the system operates. The processor's speed is determined by separate circuitry called the system clock. The clock rate determines the operating speed of the computer. The 2MHz 6510 chip is simply a version that is rated as capable of operating at clock speeds of up to 2MHz; plugging in a new processor won't change the way the computer performs.

In theory, you can double the operating speed by doubling the clock frequency. However, this opens the floodgates to a wave of other problems. For example, the 64's VIC-II video chip will produce a usable video signal only if operated at one particular clock speed. (The 128's dual-speed VIC chip can't be substituted; it has a different pin configuration.) Since the VIC-II also includes a portion of the clock circuitry, the operating speed of the 64 is graven in silicon and can't be changed.

Atari Artifacts

When I use graphics mode 8 on an Atari 800XL, I get the color registers mixed up. Somehow, I always get red and green in the picture. How can I get rid of these colors?

Marc Canoul

Your color problem has nothing to do with color registers. The problem is that the resolution of GRAPHICS 8 is too great to display properly on a color television. This problem does not appear on monochrome or high-resolution color monitors. GRAPHICS 8 uses a blue background instead of a black background to reduce the effects of these "false" colors (known as artifact colors). Some clever software designers have taken advantage of these colors for their programs. Let's turn the screen black and take a closer look. Type in and run this program:

```
10 GRAPHICS 8:POKE 710,0
15 COLOR 1
20 FOR I=0 TO 20 STEP 2
30 PLOT I,0:DRAWTO I,20
40 NEXT I
50 FOR I=21 TO 41 STEP 2
60 PLOT I,0:DRAWTO I,20
70 NEXT I
```

On our 130XE, the left patch of color is red and the right patch is blue. This may

be reversed in your computer, depending on when it was made. A white line divides the two patches. White occurs anytime there are two dots plotted next to each other horizontally. To avoid artifact colors, plot an extra point directly to the right (or left) of any point you plot on a GRAPHICS 8 screen.

Where Does The Memory Expander Fit?

I've followed with great interest the information about the new 1764 memory expander for the Commodore 64. However, I'm confused about one thing. In one description, I read that the expansion module plugs into the expansion port. In another, I read that it plugs into the user port. As you know, the expansion port holds cartridges, and the user port is the RS-232 (modem) port. I'm confused. Where does it go? I want the 1764 memory expander, but I also use my modem a lot.

Frank E. Fish

The Commodore 1764 memory expander plugs into the expansion port where cartridges reside. You should be able to use the RAM expander and a modem at the same time, although to download directly to the 1764, you'd need a RAMdisk program, one that makes the expander act like a disk drive. ©

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- ☐ Apple II series (II+, IIe, or IIc)
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- ☐ Atari 400/800, XL, XE
- ☐ Atari ST
- ☐ Commodore 64
- ☐ Commodore 128
- ☐ Macintosh
- ☐ IBM PC
- ☐ IBM PC compatible
- ☐ Other _____

Which of the following peripherals do you own or use with your computer?

- ☐ Hard disk drive
- ☐ Dot-matrix printer
- ☐ Letter-quality printer
- ☐ Color printer
- ☐ Laser printer
- ☐ 300-bps modem
- ☐ 1200-bps modem
- ☐ 2400-bps modem
- ☐ Graphics tablet / light pen
- ☐ MIDI synthesizer
- ☐ Video digitizer
- ☐ Other _____

What types of software have you purchased in the past year?

- ☐ Word processor
- ☐ Programming language
- ☐ Graphics design
- ☐ Telecommunications
- ☐ Education
- ☐ Games
- ☐ Business applications
- ☐ Other _____
- ☐ None

Which language do you prefer for programming?

- ☐ BASIC
- ☐ Assembly/machine language
- ☐ C
- ☐ Pascal
- ☐ Modula-2
- ☐ Forth
- ☐ FORTRAN
- ☐ Logo
- ☐ Other _____
- ☐ I don't program my computer

What section of the magazine do you like most? (Please check no more than two.)

- ☐ Features
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What topic(s) would you like to see covered regularly in a column?

_____

_____

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_____

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- ☐ Educational software
- ☐ Games/entertainment
- ☐ Programming languages
- ☐ Utilities
- ☐ Hardware
- ☐ Other: _____

Additional comments: _____

_____

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It happens every spring—two of the nation's biggest computer and electronics trade shows unveil all of the new hardware and software planned in the coming months for personal computers. It's an exciting panorama of machines, applications, games, add-ons, and peripherals. There was no shortage of good news in just about every area of computing, from the new Amiga 500 computer and a host of low-cost PC compatibles to a surge of software on the horizon for owners of 8-bit machines and the 16-bit Amigas, STs, and Macintoshes. This spring's shows were so strong, in fact, that some likened the present to the go-go days of 1983. The marketers and manufacturers, though, remember the dark days of 1984, and introductions are positioned to avoid any repeat of that downturn. With prices lower than ever, and capabilities greater, the remainder of 1987 promises to offer plenty of excitement no matter what computer you own.

CES and COMDEX:

A Tale Of Two Cities

Keith Ferrell, Features Editor

The story of this year's Summer Consumer Electronics Show (CES) in Chicago and Computer Dealers Exposition (COMDEX) in Atlanta is truly a tale of two cities, with different attendees, different markets, and different products.

CES In Chicago

For Atari, a host of PC-compatibles manufacturers, and most of the leading entertainment and educational software manufacturers, the city was Chicago. These companies represented a highly visible 15 percent of the show—and more than held their own among the flash of video cameras and recorders, compact disc players, boom boxes, telephones, and every conceivable combination of consumer-oriented circuitry. Their collective strength served to remind the more than 100,000 attendees at this largest of all U.S. trade shows that computers and software are, and will continue to be, an important segment of the home electronics market.

Software manufacturers eagerly displayed programs more powerful than ever before, with better graphics, more exciting sounds, more complex scenarios, and more detailed options. Developers of educational software adjusted to the increasing presence of MS-DOS machines in schools, while remaining committed to utilizing the potential of the Apple computers. Entertainment software developers unveiled a host of products for Commodore and IBM-compatible machines, as well as a generous sampling of games that exploit the full graphics and sound potential of the Amiga and the ST.

Atari's booth at CES was crowned by a full-size Cessna airplane and adorned with banners proclaiming the company as "Flying High." But in terms of new ST hardware and solid information on the availability of the company's delayed PC, Atari seemed to be in a temporary holding pattern. With first-quarter profits nine times those of a year ago, however, there was little doubt that Atari and ST would have a clearly defined flight path before the fourth quarter.

By contrast, manufacturers of PC compatibles made their plans quite clear. They are aiming themselves directly at every home electronics consumer in the country. MS-DOS–oriented manufacturers almost literally surrounded the software section of the show, a virtual wall of compatibles and clones, with add-ons, upgrades, and peripherals for nearly every purpose. The compatible and clone manufacturers indicated that they have picked this year—especially the fourth quarter—for the strongest drive yet made toward capturing those consumer households without computers.

COMDEX In Atlanta

Atlanta's COMDEX, which for the first time overlapped the CES schedule, focused more closely on hardware and upper-end business

software. It was in Atlanta that Commodore made its stand, and it was at the company's elaborate, attention-getting display that Commodore's new management defined its commitment to the Amiga, reestablishing its aggressiveness in the compatibles marketplace as well.

The number of companies entering the PC marketplace was even more dramatic at COMDEX than at CES, with COMDEX boasting dozens of MS-DOS compatibles manufacturers. IBM was there as well, its new Personal System/2 machines on display, and its new operating system on many minds. While business software was COMDEX's primary focus, entertainment and educational programs were represented. Quite a few of the software developers and marketers who had made a showing during the first few days of CES shifted their energies southward and put in appearances at COMDEX, too.

At both shows there was a sense of an industry that has by now been through enough ups and downs to have arrived at a certain aggressive self-awareness, a canniness and instinct about the marketplace and the directions it will be taking in the months to come. Every exuberance is tempered by the understanding that although the industry's size and sales volume are growing, the number of key players—with the important exception of PC compatibles manufacturers—is not. The past year witnessed the acquisition of more than a few independent software manufacturers by larger companies, and also saw the fortunes of some of software's leading players decline.

Hardware manufacturers, too, gave the impression of gathering their forces, of regrouping for a market that may be changing. Apple, which attends neither show, saw its hold on the educational market come under increasing pressure over the past year from the rising wave of inexpensive IBM compatibles, especially Tandy's 1000EX and SX machines, in the schools.

IBM itself is busy establishing its new machines and awaiting the introduction of the new Microsoft operating system that will exploit the full potential of the new machines. For many MS-DOS compatible manufacturers, 1987 looms as a make-or-break year: Prices for compatibles have come down dramatically, but it is still too early to tell just how large a segment of the public actually wants PCs, not to mention the fact that there are far more manufacturers than retail shelf space can readily accommodate.

Determination On Display

Still, the attitude at CES and COMDEX was one of considerable optimism. Martin Davies, president of Firebird Licensees, a software manufacturer, noted that while the home computer industry is not for the faint-hearted, the market nonetheless offers unbounded opportunities. "We can do more with software than ever before," Davies said, "graphically, conceptually, and in terms of market penetration. And the consumers are there, ready to respond. For those who can get their act correct, the sky remains the absolute limit."

While the Commodore 64 continues to drive the entertainment software market, Apple and MS-DOS machines have established a permanent and growing presence to which all developers are responding. "The installed base of 64s, not to mention the fact that it's a great gaming machine, makes it the logical choice for initial development," observed Michael Harrison, communications manager for Microprose. "Once you've done a game for the 64, then it becomes a matter of adapting it for other machines and their particular capabilities." For the forthcoming IBM version of its *Gunship* helicopter simulation, for example, Microprose is offering hard-disk installability, as well as a boot that automatically configures the game to the clock speed of the machine on which it is being run.

While virtually all software exhibitors expressed confidence in a permanent 64 market, they were also aware of the dynamic growth of MS-DOS machines. "The price drop on the compatibles, along with the fact that most of them have some sort of color card now, means that compatibles are as serious an entertainment market as 64s," said Bob Botch, vice president at Epyx. "In fact, I wouldn't be surprised to see 64 software and PC software running neck-and-neck this Christmas."

Even show attendees with no connection to the computer industry could be found staring wide-eyed at the dazzling graphics of the Amiga and the ST. From entertainment software to digitized images to word processing, the demos running on these computers were vivid proof of the astonishing feats of which personal computers are now capable. Nearly every software developer present announced Amiga and ST packages, some created for those machines alone. Commodore's renewed commitment to the Amiga, and especially to the Amiga 500, means that the number of programs for those machines will continue to grow.

While the Commodore 64 continues to drive the entertainment software market, Apple and MS-DOS machines have established a permanent and growing presence to which all developers are responding.

Familiar Faces Made Fresh

For the most part, entertainment software manufacturers and designers introduced enhancements and refinements of existing and established game categories. It was as if they had decided in concert to wring every refinement possible out of their currently popular software before creating new categories. Flight and air-combat simulators, auto-racing programs, sports and martial-arts games, strategic battle recreations, text adventures, and arcade action offered higher resolution, higher impact graphics, smoother animation, a larger number of more detailed

screens, longer and more complex parsers and narrative scenarios, as well as levels of complexity that could challenge and engage the most experienced gamers.

Educational software developers applied equal energy to their new generation of programs. Much of the school-oriented software took traditional approaches to tutorial material, with bowling games, rocket ships, and other arcade-style rewards for successful spelling, calculation, or other academic accomplishment. The software, though, demonstrated the same increasingly effective and smooth animation, as well as taking advantage of pull-down menus and windows.

The growth in school-system purchases of MS-DOS systems has not gone unnoticed by educational developers. Jan Davidson, president of Davidson & Associates, an educational software company, estimated that MS-DOS versions would account for as much as 40 percent of her company's sales this year. "There's no question that MS-DOS is taking a larger and larger share of the educational software market," Davidson stated. "But Apple remains the most popular classroom computer, and it would be a mistake to underestimate the educational future of Apple machines."

Desktop publishing programs continued to be introduced by developers, with packages whose capabilities put Macintosh-like publishing programs in the reach of virtually all computer owners. The Commodore 64 was the focus of much desktop publishing development, with *PrintMagic* from Epyx, *GeoPublisher* from Berkeley, and *The Timeworks Desktop Publisher* from Timeworks all being introduced at CES.

Commodore's Push At COMDEX

Little more than a month after going through a major corporate reorganization, Commodore made clear at COMDEX its intentions to move the new Amiga 500 and 2000 computers aggressively into home and business markets, respectively.

Commodore decided against exhibiting at CES this year, but made an impressive showing at COMDEX with a large booth displaying all three Amigas: the original 1000 and the two new versions. Within the exhibit space, two dozen software companies showed their latest products for the Amiga, including a wealth of new audio, video, entertainment, and applications programs.

Not only were there a host of new products for the Amigas at the booth, but the amazing audio and visual capabilities of these machines drew show-goers like a magnet. Color video digitizers, color paint programs, television video production software, MIDI sound studio programs, desktop publishing packages, and other programs effectively showed off the Amiga's graphics and sound powers. And of equal importance, serious application programs such as the *WordPerfect* and *ProWrite* word processors were also on display.

On another front, so successful have the Commodore 64 and 128 computers been that the company no longer feels any urgency to display those computers at trade shows. Company officials noted that the 64 has now reached the seven million mark in sales over the past five years. The 128 also continues to sell well, with more than a million machines purchased by consumers. As noted below, there's still plenty of new software planned for the 64 and 128.

However, Commodore clearly sees the Amiga family of machines as the cornerstone of the company's future. The Amiga 500 and 2000 computers have reportedly been selling well in Europe for several months, and Commodore arrived at COMDEX with 500s ready to ship throughout the U.S. and Canada.

The 500 and 2000 are Commodore's response to those who complained that the original Amiga 1000 was priced too high for the home market and was too limited in features for a high-end business machine.

Homeward Bound Amiga

Commodore officials hope that the Amiga 500, priced at $699 without monitor, will sell into the home market the same way that the Commodore 64 and 128 have. The A500 comes with 512K of memory that can be expanded to one megabyte by the user with an optional expansion card, a built-in 880K, 3½-inch floppy disk drive, an expanded keyboard with separate cursor and numeric keypads, the Kickstart 1.2 operating system built into ROM instead of on disk, and a 35-watt power supply.

Commodore's new Amiga 500 computer, priced at $699 without monitor, is aimed directly at the home computer user.

The new 500 and the earlier 1000 have the same stereo audio outputs, system expansion bus, RGB and composite video outputs, and two joystick/mouse ports. One of the differences between the Amiga 500 and the 1000, however, is that the genders of the RS232 serial port and Centronics-standard parallel port were swapped, which enables the 500 to work with IBM PC modem and printer cables.

"With the acclaimed Amiga performance and the price point of $699, the A500 will aggressively drive the home market segment," says Alfred Duncan, Commodore's new general manager.

The Powerful 2000

The 2000, an expandable Amiga with slots for both Amiga and IBM cards, is scheduled for release in the U.S. in late summer. Priced at just under $2,000 without a monitor, the Amiga 2000 is a high-end computer system which Commodore will direct toward traditional business markets and emerging computer markets such as desktop publishing, advertising, video and film production, and other fields requiring a cost-effective and versatile computer video system.

The one-megabyte Amiga 2000 can be expanded to nine megabytes of memory, and with the addition of an optional Bridgeboard, it becomes IBM compatible. The system has seven expansion slots configured as either Amiga or standard IBM XT slots, a built-in 880K, 3½-inch floppy disk drive, three drive ports, a video expansion slot, and a 200-watt power supply. The front section of the system box

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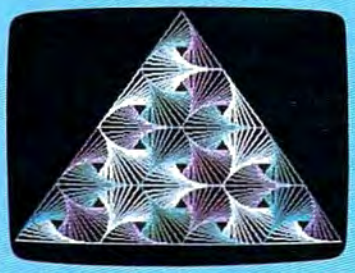

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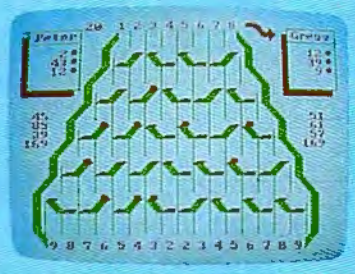
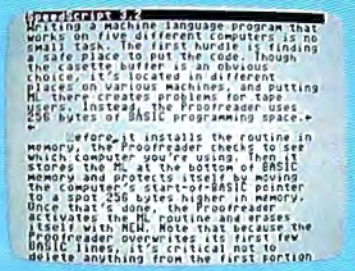
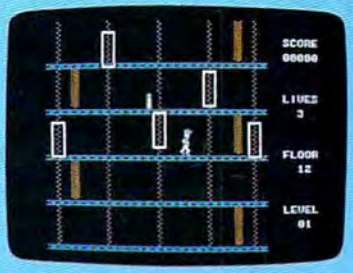




Writing a machine-language program that works on five different computers is no small task. The first hurdle is finding a safe place to put the code. Though the cassette buffer is an obvious choice, it's located in different places on various machines, and putting ML there creates problems for tape users. Instead, the Proofreader uses 256 bytes of BASIC programming space.

Before it installs the routine in memory, the Proofreader checks to see which computer you're using. Then it stores the ML at the bottom of BASIC memory and protects itself by moving the computer's start-of-BASIC pointer to a spot 256 bytes higher in memory. Once that's done, the Proofreader activates the ML routine and erases itself with NEW. Note that because the Proofreader overwrites its first few BASIC lines, it's critical not to delete anything from the first portion



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has space for one additional half-height PC-compatible 5¼-inch disk drive and two 3½-inch drives. The user can configure the drive options in any variety of floppy and hard drives desired.

All three Amiga versions use the same Motorola 68000 microprocessor running at 7.16 MHz, have the same four screen resolutions ranging from 320 × 200 to 640 × 400, and the same custom sound chip, custom animation chip, multitasking operating system, custom graphics chip, and two-button mouse. And, they're all compatible with one another. (For more details, see the March and April issues of COMPUTE!.)

Commodore officials believe that over the next several years the Amiga 2000 will be used in a variety of new ways as other business markets begin to use computers more often and more effectively. "Amiga's outstanding graphics make it an ideal machine for PC-CAD [Computer-Aided Design] and other desktop design applications," says Duncan. "This is a huge market that will increasingly shift to smaller systems in the next five years."

As noted in last month's "Editor's Notes," Commodore went through a corporate reorganization in April that removed Chief Executive Officer Thomas Rattigan and a number of senior managers on his staff. The new team in U.S. operations, led by Alfred Duncan and General Sales Manager Richard McIntyre, is moving swiftly to accomplish the mandate set out by long-time Commodore International Chairman Irving Gould: Increase U.S. sales of the Amiga to the level already being achieved in Europe.

Going To Market

To help accomplish that goal, Commodore is in the process of revamping its sales strategy by beginning direct sales to independent computer retailers. At a COMDEX press breakfast, Alfred Duncan announced the plan, which is aimed at giving the Amiga computers greater visibility. Diminished emphasis will be placed on Commodore's traditional distributor-based sales.

"We looked long and hard at the way the three most successful computer companies were doing business and knew it was time to make a change," says Duncan. "It's clear that the best way to sell computers is the most direct—and that's the approach we're taking."

The emergence of the new Amiga 500 and 2000, along with Commodore's announced aggressiveness in the sales area, is good news to Amiga fans. In the home market, especially, the many software companies that have supported the Amiga from the outset have been waiting eagerly for the 500 to begin selling in the U.S. The new machines will also mean that more software publishers will move toward the Amiga as the installed base of users grows.

Atari: The Road Not Taken

Atari was perhaps the company hit hardest by the overlapping CES and COMDEX trade shows. CES is heavily consumer-oriented, and COMDEX is predominantly business-oriented. Since Atari aims at both markets with its videogames, home computers, ST series, and PC clones, it wanted to exhibit at both shows. Unfortunately, the company couldn't split its resources and opted for CES instead of COMDEX—just the opposite of Commodore.

As a result, Atari scored big at CES with its videogame machines and cartridges. But the long-awaited Mega STs were nowhere to be seen, and Atari announced no firm release dates or prices for them. The same applies to the laser printer, a key component of the ST desktop publishing system unveiled at the Winter CES in January.

Another product announced in January—the Atari PC clone—sat by itself in a corner at Summer CES, almost escaping attention. Again, Atari announced no release date. And at COMDEX, the absence of an Atari exhibit rendered Atari almost invisible at the show. The only refuge from the MS-DOS chaos seemed to be the Commodore exhibit, which was packed with dazzling Amiga software and fascinated onlookers.

Sig Hartmann, Atari's vice president of software, expressed some regret over Atari's absence during his short tour of COMDEX. "We'll be here in November [at the Fall COMDEX in Las Vegas]," he promised.

Making Lemonade

Meanwhile, back in Chicago at CES, Atari's videogame strategy racked up a lot of points with mass merchandisers. Apparently a new generation of youngsters has sparked a resurgence in videogame machines, and Atari just happens to be sitting on a gold mine of game cartridges and proven videogame hardware.

There's an old saying that goes, "If life gives you a lemon, make lemonade." The lemon, in this case, is the Atari 65XE, at $89.95 the lowest-priced eight-bit home computer remaining in the U.S. market. Despite the fact that the 65XE is an enhanced 64K version of the respectable Atari 800 that sold for $1,100 just six years ago, it isn't selling as well as Atari thinks it should. (At least, not in the U.S.—Atari says that foreign sales are healthier.) According to Atari, U.S. retailers complain that they can't sell low-end home computers anymore. Everyone wants either a higher-end personal computer or a videogame machine.

So Atari is making lemonade. After a cautious taste-test at the Winter CES in January, Atari showed up this time with a full-blown XE videogame system. Atari took a 65XE computer, detached the keyboard, redesigned the case with colorful pastel pushbuttons and a top-mounted cartridge slot, tossed in a matching joystick and gun controller, and bundled the whole package with three cartridges: SubLogic's *Flight Simulator II*, the classic *Missile Command*, and *Blast 'Em*, a new shoot-'em-up.

It's still a computer—when you plug in the keyboard (included) and a disk drive (not included), you're back to a regular 65XE, fully compatible with all Atari eight-bit programs and peripherals. But it doesn't *look* like a computer, and apparently that makes a big difference to mass merchandisers. At CES they went crazy over the machine. The suggested retail price, incidentally, is $150.

To make certain that plenty of games are available, Atari is unearthing old classics and even buying up rights to long-deceased games by other companies (and at bargain rates, we hear). Old games

which were available only on disk are being converted into cartridges, thanks to a recent innovation that makes it possible for Atari to squeeze up to 128K of data into what was originally designed to be an 8K cartridge.

The XE videogame system is yet another ironic twist in the evolution of the home computer. Was it only five years ago that everyone suddenly wanted a real computer instead of a videogame machine?

A New Disk Drive

Also on the eight-bit front, Atari introduced a new disk drive that's compatible with the XE, XL, and 400/800 computers—but it's not the 3½-inch drive that everyone was expecting. Instead, it's a faster, higher-capacity 5¼-inch drive.

Atari says the XF 551 is rated 50 percent faster than the current 1050 drive and can handle three disk formats: Atari single density (88K formatted), Atari dual density (127K formatted), and true double density (360K formatted). The XF 551 will come with a new disk operating system, ADOS, which adds such features as time/date-stamping and subdirectories. Atari announced no firm release date or price, but said the XF 551 would cost roughly the same as a 1050.

The 3½-inch drive for the eight-bit computers, which has been rumored for two years, seems doomed to oblivion. An Atari spokesman said that when Atari approached software publishers with the idea, only one company expressed interest in reissuing its programs on microfloppies. That made the 3½-inch drive a moot point.

Birth Of A Salesman

Atari's only significant ST-related announcement at Summer CES was that a major advertising campaign is scheduled to begin by September and continue through December. One of Atari's prime goals for 1987 is to boost U.S. sales of the ST, and that means widening distribution and increasing visibility.

Atari says it is quadrupling its advertising and promotional budgets for both the computer and videogame lines. Seven TV commercials have been prepared for network broadcast this fall—four for the ST series, two for the XE videogame system, and one for the 7800 videogame machine. Radio commercials are scheduled to air on top-40 stations, and magazine advertisements will run in consumer and computer publications. Atari is also planning to advertise its videogame machines in comic books for the first time.

TV screens at the Atari booth were continuously showing previews of ST commercials. They are reminiscent of the aggressive spots that Atari Chairman Jack Tramiel successfully used to promote the Commodore 64 during the early 1980s when he was in charge of Commodore. In one spot, Tramiel's personal business philosophy—"Business is war"—fills the screen with huge letters as the unseen narrator compares the 1040ST to the IBM PC AT and Apple Macintosh.

All four commercials emphasize that the 1040ST comes with twice as much memory as a Macintosh and four times as much as a PC AT, yet at only one-half or one-fourth the price. One satirical scene shows the "extra features" that, according to Atari, account for the higher price of a Mac or AT—the Apple and IBM logos. Another spot attributes the success of the Macintosh and AT to the marketing prowess of Apple and IBM rather than to the computers themselves. All four commercials end with a rapid-fire sequence of typical Atari ST color screens.

MS-DOS On The March

While Atari put on its show in Chicago, and Commodore took its act to Atlanta, PC compatibles manufacturers were *everywhere*.

Whether for home office, the workplace, or consumer entertainment, MS-DOS machine manufacturers perceive a solid price-driven commodity market for their products. Concerns about the effect of trade restrictions on imported chips did not dim manufacturer enthusiasm for 8088 and 8086 machines, whose inventories are already high and whose prices are little affected by the restrictions. Intel's 80386 is the chip most directly affected by the restrictions, with most 386 machine manufacturers facing back orders and delivery slowdowns as a result of trade legislation.

The broad consumer market for PCs is 8088- and 8086-driven anyway, and there is a large supply of those machines on-hand and ready for retail shelves. And most manufacturers feel the consumers are ready to empty those shelves during the third and, especially, the fourth quarters of this year. With machines and marketing poised at the starting line for these two crucial quarters, manufacturers are getting ready to *deal*.

Confidence In Consumers

Perhaps confident that consumers are already well aware of their MS-DOS machines through the Radio Shack retail network and aggressive television and print ad campaigns, Tandy skipped CES altogether, and at COMDEX it concentrated its energies on the workstations with which it hopes to woo the business market. Both PC- and AT-level workstations were on display in Atlanta, as well as the company's Tandy/3 networking hardware.

Other manufacturers expressed similar confidence in the market, but were less sanguine about presenting their wares.

"Consumers know what PCs are by now," said John Rossi, president of Blue Chip, "and they're increasingly comfortable with the idea that someday, *soon*, they're going to have one. We've put together a package that gives us room to be aggressive, and we're going to be." With a new advertising campaign, and an increasing name recognition, Blue Chip, Rossi believes, could achieve sales of 30,000 to 50,000 units between now and the end of the year.

One of the marketing tools Blue Chip will be using to pursue those sales is its *Ready-to-GO!* kit, a package of applications software, demos, publications, and coupons redeemable for savings on products and services. The package is intended as an add-on sale at point-of-purchase, with a suggested retail of $49.95, although Rossi pointed out that some retailers may choose to be flexible on the price. "We can also shift the contents of the kit to suit seasonal needs such as Christmas, tax time, or SAT time," Rossi said.

PC Popular, Blue Chip's flagship PC, offers a dual-speed 8088 processor, 512K RAM (expandable

$10,000.00 Programming Contest!

COMPUTE!'s Apple Applications

First Prize $5,000.00 Second Prize $2,500.00 Third Prize $1,000.00

Three Honorable Mentions $500.00 each

COMPUTE! Publications, Inc., a longtime leader in personal computer publishing, is turning its popular semiannual COMPUTE!'s Apple Applications into a bimonthly magazine starting this fall. Each issue will include high-quality programs for the Apple II+, IIe, IIc, and IIGS computers, ready for readers to type in and run. Along with the best in Apple software, readers will find feature articles, tutorials, reviews, and other Apple information in the new, expanded COMPUTE!'s Apple Applications. We're also offering a companion disk containing each issue's programs, as well as a magazine/disk subscription.

To find the very best original software for Apple II–series personal computers, we're sponsoring a programming contest with $10,000.00 in prize money for the top six winners. In addition, the winners will receive standard purchase fees for publication of their programs in our magazine and royalties if they're republished in COMPUTE! books.

Even if your contest entry doesn't win a prize, you'll still earn purchase fees if we accept your program for publication.

Interested? If so, here are the rules:

1. Entries must be your original work, previously unpublished in any form. All those whose programs are accepted will be required to affirm this in writing.
2. You can submit as many entries as you want, but we cannot consider programs which currently are entered in other contests or are submitted for publication elsewhere.
3. The contest deadline is December 31, 1987. All entries must be received at our offices by this date. Programs submitted after this date will still be considered for publication, but will not be entered in the contest. If we purchase an entry for publication before the deadline, the entry is still eligible to win.
4. Entries are allowed (and encouraged) in virtually all software categories: home and business applications, education, recreation, telecommunications, graphics, sound and music, and utilities.
5. Entries may be written in either Applesoft BASIC, machine language, or a combination of the two. All possible efforts should be made to insure that an entry runs under both DOS 3.3 and ProDOS. Programs must be of a publishable length—BASIC and machine language program listings are printed in *COMPUTE!'s Apple Applications*. Although this length is quite flexible, it's unlikely we would publish a BASIC program of more than 12K or a machine language program of more than 6K. Exceptional software which exceeds these sizes will certainly be considered.
6. Entries must be submitted on 5¼-inch floppy disks. If your program is written in machine language, you must submit both the object code and all of the source code required to compile the program.
7. Entries must be accompanied by an article which explains how to use the program and what it does. If your program employs any new or unusual techniques that you think will be of interest to other programmers, you can also describe how the program works. (If you feel that writing is not your strong point, please do not hesitate to enter; this is a programming contest and the entries will be judged solely on the basis of the programs submitted.)
8. Submissions which do not win a prize and are not accepted for publication will be returned only if accompanied by a self-addressed, stamped mailer.
9. Members of the staff of COMPUTE! Publications, Inc., will judge the contest, and all decisions regarding contest entries and acceptances will be made solely at the discretion of COMPUTE! Publications, Inc. All decisions are final. This includes decisions regarding creativity, similarity among entries, and general suitability.
10. Winners will be announced by COMPUTE! Publications, Inc., in the spring of 1988.
11. This contest is void where prohibited by law. Full-time, part-time, and previous employees of COMPUTE! Publications, Inc., and Capital Cities/ABC are ineligible for the contest, but may still submit work for publication at standard rates.

Every contest entry must include this signed form:

I warrant that the program presently entitled _____ is my own original work and that the work has not been submitted for consideration elsewhere, nor has it been previously published in any form. If my work is accepted by you, I understand that your decision as to the selection of winners and awarding of prizes is final and without recourse on my part. Should you select my submission, I understand that I will receive no payments until I sign your standard contract, which includes assignment of the copyright of the program to COMPUTE! Publications, Inc., and that you may use my name and image in promotional materials and other forms. *(If you are under age 18, your parent or legal guardian must sign for you.)*

Signature: _____

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to 640K), a mouse, a single 5¼-inch 360K disk drive with controller for a second disk drive, two expansion slots, MS-DOS 3.2, and GW BASIC; monitors, mass storage devices, and other add-ons are available as options. Rossi noted that the full retail price for the PC Popular is $549, but added that, as with *Ready-to-GO!*, Blue Chip has left generous margins for the retailers to manipulate.

Rossi described as "unfounded" recent trade press rumors of difficulties with Hyundai, the Korean conglomerate which serves as Blue Chip's manufacturer and is also providing machines. "Blue Chip is a recognized name in the industry," Rossi said, "and it's the Blue Chip computer that consumers will shop for."

In Atlanta, Hyundai Electronics introduced a compatible under its own name. The Hyundai Super-16 uses an 8088 chip and processes at 4.77 MHz, with 256K RAM, a single 360K disk drive, MS-DOS 3.2 and GW BASIC, six expansion slots, and a monochrome graphics controller. Options include RAM expansion on the motherboard, color and monochrome monitors, mass storage devices and controllers. Hyundai Electronics also announced two 80286 units, each processing at 8 or 10 MHz, with 512K on the motherboard (expandable to one megabyte). Because Hyundai will be selling the machines only to distributors, no prices were announced.

Introduced at COMDEX, Cordata's IBM compatible WPC offers an 8088-2 processor capable of running at either 4.77 or 8 MHz, both CGA and AT & T 6300 graphics support, 512K RAM (expandable to 768K), four expansion slots, two 360K disk drives, and a built-in, tilting monochrome monitor. The WPC is priced at $1,095.

Also showing at COMDEX was Zenith's redesigned eaZy PC, a one-piece system that uses 3½-inch disks. The computer's 8088-compatible processor runs at 7.16 MHz, and the machine is available in three configurations: Model 1, with a 720K disk drive, priced at $999; Model 2, with two 720K disk drives, for $1,199; and Model 3, which has one disk drive and a 20-megabyte (MB) hard disk, for $1,699.

More Machines For First-Timers

England's Amstrad was very much a presence at CES and COMDEX, showing off the PC compatible that has achieved much success overseas. Marketed in this country by Vidco, the Amstrad PC 1512 comes with an 8 MHz 8086 processor, 512K RAM (expandable to 640K), three expansion slots, MS-DOS 3.2, Digital Research's DOS Plus, Digital Research's Graphics Environment Manager (GEM), GEM Desktop and Paint applications programs, a mouse, and a monitor whose housing contains the power supply for the computer, helping to achieve both a small footprint and an "all-in-one-box" market profile.

With a single 360K 5¼-inch disk drive and monochrome monitor, the 1512 is priced at $799; with dual drive the price is $1,099. Color monitor configurations are priced at $1,099 for single disk drive, $1,299 for dual disk drive. Configured with a 20MB hard disk, Amstrad is marketing machines at $1,499 for monochrome, and $1,699 for color.

At COMDEX, Amstrad also announced an EGA machine, the PC 1640, with prices beginning at $899 for single disk drive and mono monitor, up to $1,999 for a hard-disk enhanced version. Aware of the peripherals market that accompanies PC sales, Amstrad announced two dot-matrix printers with full PC compatibility.

Wally Amstutz, vice president of marketing for Amstrad in the U.S., projects third- and fourth-quarter sales approaching 50,000 units for the company's machines. "We found in England," Amstutz stated, "that Amstrad can quickly carve out as much as a 25 percent share of the PC market before beginning to reduce the sales of other companies—in other words, we're tapping a market that hasn't previously bought computers, as well as providing a new alternative for existing computer users."

Toshiba announced two new laptop computers, the T1000 and the T1200. The T1000 weighs 6.4 lbs., and has a single 3½-inch 720K disk drive, 512K RAM, and MS-DOS 2.11 in ROM, as well as a 25-line LCD screen. With shipment anticipated for July, the T1000 is priced at $1,199.

Also debuting at COMDEX was the company's T1200, a 10.8 lb. laptop with a built-in 20MB hard disk, a 3½-inch 720K disk drive, 1MB RAM, with a 80C86 processor that delivers clock speeds of 9.54 and 4.77 MHz. In addition to MS-DOS 3.2, Toshiba is bundling Borland's *Sidekick* with each T1200. Price and delivery of the new machine are to be announced later.

Epson America was present at both shows, introducing its Apex PC compatible. The Apex is 8088-based, offering 512K on the motherboard (expandable to 640K), three expansion slots, two 360K 5¼-inch disk drives, MS-DOS 3.2, and GW BASIC 3.2. The Apex is being marketed at a suggested retail list of $899. Monitors, mass storage devices, printers, and modems are available from Epson as options.

Netherlands-based Vendex International took advantage of the Chicago CES to unveil its PC compatible, the Turbo-888-XT. Marketed in this country by Vendex Pacific, the Samsung-manufactured basic model Turbo-888-XT includes a monitor in all configurations, is built around Intel's 8088-2 processor, and runs at either 4.77 or 8 MHz. It has two 360K 5¼-inch disk drives; 512K RAM (expandable to 768K); a graphics card capable of monochrome, Hercules, or color graphics configuration; an external color/mono switch; a full-size AT-style keyboard; RAM-resident utilities software including menu-driven DOS; an interactive tutorial program called *Headstart* for the first-time computer user; and applications software that includes word processing, RAM-resident pop-up desktop functions, a spreadsheet, and a database program. The Vendex system is packaged with over $1,000 worth of software, service, and add-ons coupons.

"We feel that we're the first of the compatibles manufacturers to come into the American market with the resources to mount a huge, ongoing marketing campaign," noted Alex Weiss, the company's product manager. "Our parent corporation is an over–$9 billion group that has already achieved substantial success with computers in foreign markets."

Weiss believes that Vendex's interactive tutorial approach, along with the bundled software including

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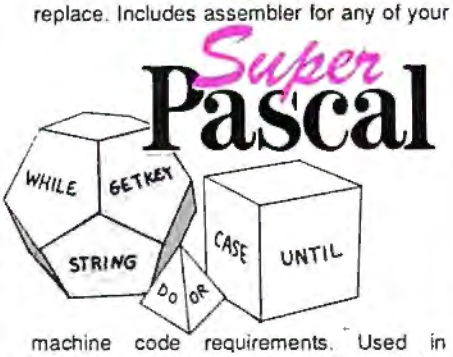

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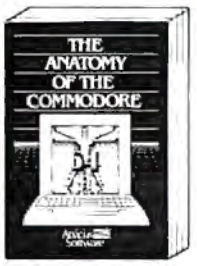

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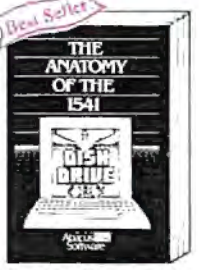

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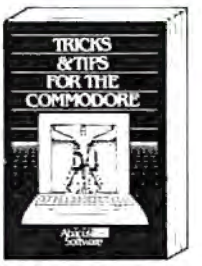

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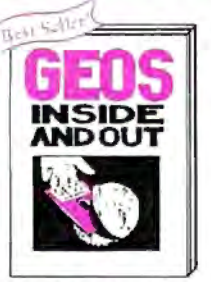

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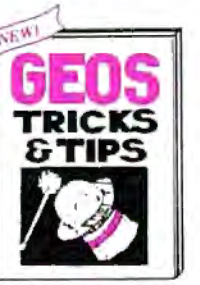

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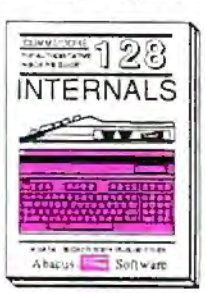

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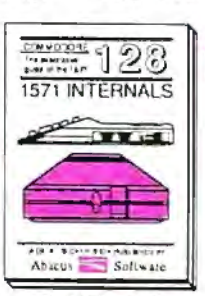

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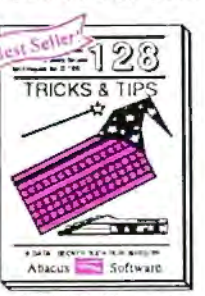

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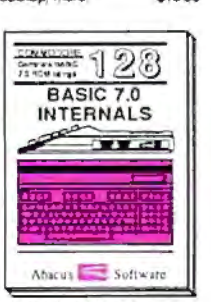

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The Turbo-888-XT is available with green monochrome monitor for $995; with color monitor, the system is priced at $1,295. Through its Easy-Does-It peripherals program, Vendex will provide a hard card with autoformatting software, a Migent-style mini-modem, and memory upgrade chips with a chip insertion tool. Confident of selling at least 50,000 units during the third and fourth quarters, Vendex placed an initial order with Samsung for 200,000 computers, according to Weiss.

More Than Apple Compatible

Franklin Computer, having gained experience with Apple compatible machines, continued to push its PC compatibles. Priced at $699.95, the Franklin PC-6000 includes 512K RAM (expandable to 640K), a single 360K disk drive, MS-DOS 3.1, and a single open slot. At $799.95, it offers the same features, with two disk drives.

Options available from Franklin include a $39.95 battery backed-up clock/calendar, and MS-DOS 3.2 and GW BASIC for $99.

Video Technology Computers is another Apple-compatible manufacturer now looking to tap the PC market, extending their Laser line with new MS-DOS machines, the Laser Compact XT and XTE. The company is using the same box for both its Apple and MS-DOS lines, establishing for perhaps the first time a visual compatibility between the two types of computer.

Featuring 512K RAM (expandable to 640K), dual speeds of 4.77 or 8 MHz switchable from the keyboard, a 5¼-inch disk drive, and an expansion slot, the Laser Compact XT is priced at $599. The XTE comes with 640K RAM (expandable to 1MB), a built-in EGA, dual speeds of 4.77 or 10 MHz, a 5¼-inch disk drive, and a realtime clock with battery backup. Laser's Compact XTE carries a suggested retail tag of $649.

Here Clones Commodore

While Commodore was busy making clear its Amiga commitment, the company did not neglect its PC compatible line, attracting much attention by slashing prices and adding features including Borland's popular *Sidekick*, which will be bundled with all Commodore PCs.

Commodore's PC10-1 provides 512K RAM (expandable to 640K), one 360K disk drive, five expansion slots, and MS-DOS 3.2. The company's PC10-2 comes with two 360K drives and 640K on the motherboard. All Commodore PCs come complete with a Commodore monitor, and are available in the following prices and configurations: the PC10-1 with mono monitor, $799.95; the PC10-2 with mono monitor, $899.95; the PC10-1 with color monitor, $999.95; and the PC10-2 with color monitor, $1,099.95.

As with Amiga displays showing the effectiveness of office software such as *WordPerfect* on that machine, Commodore's PC price cuts and solid corporate endorsement seemed aimed at reminding COMDEX attendees that Commodore *Business* Machines means business.

386 Machines

Continuing its direct-response marketing assault on the big business bastions of IBM and Compaq, Texas-based PC's Limited took advantage of COMDEX to announce the availability of its 80386 machine, the 386^{16}, priced from $4,499 to $6,499, depending on system configuration, which ranges from a 40MB hard drive and monochrome at the low end to a 150MB drive and EGA at the upper end.

In all configurations, the 386^{16} delivers a megabyte of pure static RAM, a 1.2MB 5¼-inch disk drive, PC's Limited's proprietary SmartVU speed and diagnostic panel, and a 101-key keyboard.

Despite the excitement over its 386 line, PC's Limited is not neglecting the 80286 models that have been responsible for much of the company's success. The two models built around the 80286 are the 286^{8}, running at 8 MHz and priced at $1,249; and the 286^{12}, running at 12 MHz for $1,999. Each offers one megabyte of RAM, a 1.2MB disk drive, SmartVU, and eight expansion slots. The company is also offering an optional on-site service contract through Honeywell Bull.

Coinciding with the shows was PC's Limited's announcement of record first quarter profits. The company announced as well the change of its name from PC's Limited to Dell Computer Corporation. Founder Michael Dell noted that the new name better reflected his firm's commitment to and presence in the business market, as well as solving certain problems with the use of "Limited" as a corporate identifier in the United Kingdom. Dell Computer plans a mid-June introduction of its products into the U.K. marketplace.

Advanced Logic Research announced the ALR 386/2, with 1MB of RAM (expandable to 2MB), a 1.2MB 5¼-inch disk drive, 8 expansion slots, and a 101-key keyboard. Priced at $1,990, the ALR 386/2 typifies company vice president David Kirkey's declaration of "intent to dominate the 80286 and 80386 market."

The company offers 2MB RAM models with mass storage devices of up to 130MB at prices ranging from $3,990 to $7,299.

Software By The Score

One thing that every machine announced or reaffirmed at CES and COMDEX will need is software, and the software developers and publishers had plenty of products nearing completion or on-hand to fill that need. The following is an encapsulated tour of many—but by no means all—of the new product announcements from the spring shows.

Accolade. *Test Drive*, announced at CES, puts users behind the wheels of Ferrari Testarosa, Lamborghini Countach, Lotus Esprit Turbo, and several other top-line sports cars. The player's perspective is that of a driver inside the car, with instrument panel, rear-view mirror, a radar detector,

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Editors of COMPUTE!
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A comprehensive reference guide to the Atari ST, this book explores in detail Logo and BASIC, the advanced features of the ST such as GEM and TOS, and every aspect of programming from concepts to actual program writing.

COMPUTE!'s Technical Reference Guide Atari ST Volume One: The VDI

Sheldon Leemon
ISBN 0-87455-093-9 343 pages $18.95

Filled with program examples written in C, machine language, and BASIC, this guide to programming graphics on the Atari ST is a must for every intermediate-to advanced-level programmer. Written by the noted ST columnist Sheldon Leemon, *COMPUTE!'s Technical Reference Guide—Atari ST Volume One: The VDI* covers everything you need to know to exploit the advanced graphics capabilities of this 68000-based computer from Atari. Topics covered include how to open and close a workstation, draw lines and geometric figures, copy graphic images, manipulate text, and do much more.

Learning C: Programming Graphics on the Amiga and Atari ST

Christopher D. Metcalf and Marc Sugiyama
ISBN 0-87455-064-5 421 pages $18.95

C is the language of choice for many professional programmers. This tutorial is the perfect introduction to programming in C on the Atari ST and Commodore Amiga. Using numerous program examples, the authors explain, clearly and concisely, how to program the ST and Amiga in the C language. This is an exceptionally helpful book for beginning and intermediate C programmers. *There is also a disk available which includes the programs in the book. Amiga version, 645DSK1, $15.95; Atari ST version 645DSK2, $15.95.*

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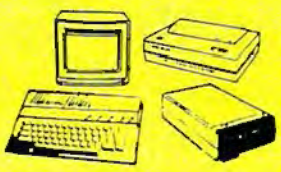

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and other features. Drivers must pit their skills against actual road conditions, including twisting mountain highways, tumbling rocks, and the highway patrol. *Test Drive* will be available for the Amiga and the ST at $44.95, for IBM compatibles at $39.95, and for the Commodore 64 at $29.95.

With *Apollo 18: Mission to the Moon,* Accolade lets players recreate some of the space program's finest moments as they take the role of both mission control and astronaut, completing a variety of tasks in order to achieve successful lunar missions. There are eight separate activities ranging from prelaunch to moonwalk to splashdown; each activity requires mastering specific skills without which the mission fails. *Apollo 18* will be available for the Commodore 64 at a suggested price of $29.95.

Sigma 7 is the company's latest addition to its midprice Advantage line. An arcade-style space game, *Sigma 7* is available for the Commodore 64 at $14.95, suggested retail.

Accolade, 20813 Stevens Creek Blvd., Cupertino, CA 05014

Activision. Activision is in the process of cutting back on the development of traditional productivity programs while building its share of creativity and entertainment packages. The company has established relationships with software developers such as Lucasfilm Games, Sierra On-Line, and New World Computing for a variety of development and distribution projects.

At CES, the company announced a number of new programs, including *Maniac Mansion,* an animated comedy adventure developed with Lucasfilm for the Commodore 64 and Apple II computers; *The Last Ninja,* a martial arts program for the Commodore 64 scheduled for fall release (PC compatibles and Apple II later) that features more than 130 screens of three-dimensional color graphics and more than 1000 moving objects; *Top Fuel Eliminator,* a colorful drag-racing fast-action game for the Commodore 64 and Apple II computers; and *Writer's Choice Elite,* an Apple IIGS–specific word processor with a *MacWrite*-like environment and the ability to combine graphics and text easily, joining a growing

In The Last Ninja *from Activision, your challenge is to use martial arts skills and weapons to recover the long-lost scrolls of wisdom that are held on a fortified island.*

list of Apple IIGS-specific programs from Activision.

Also introduced by Activision were *Draw Plus,* an Apple IIGS full-color drawing program, and the Apple IIGS version of *GBA Championship Basketball,* an action sports game already available for several other computers.

Activision, 2350 Bayshore Pkwy., Mountain View, CA 94043

Berkeley Softworks. The developers of the *GEOS* operating system for the Commodore 64 and 128 computers announced two new products to add to the growing number of applications being developed for the system: *geoPublish,* a desktop publishing program that allows multipage documents with multicolumn layouts and easy mixing of graphics and text; and *geoProgrammer,* a full-featured application development package for users with a good understanding of 6502 assembly language. Both are scheduled for fall release.

The $69.95 *geoPublish* software permits the creation of customized master pages of graphics and text that can be used on each page of a document and can be loaded from a library or saved for later use. Layout is carried out by defining rectangular regions on each page, which will automatically reformat as the user needs to modify the layout. Text automatically flows around graphics. An on-screen toolbox contains graphics tools, and there are additional type fonts for headlines up to 48 points. All pages can be previewed before printing, and the finished documents can be printed on any *GEOS*-compatible printer. A special *PostScript* driver allows printers like the Apple LaserWriter to produce near-typeset documents.

geoProgrammer, also $69.95, contains three functions: *geoAssembler, geoLinker,* and *geoDebugger.* The *geoWrite* word processor is used as the editor for the assembler. Other *GEOS* programs include *geoFile, geoCalc, Writer's Workshop, DeskPack I, FontPack I,* and *geoDex.*

Berkeley Softworks, 2150 Shattuck Ave., Berkeley, CA 94704

Brøderbund. Makers of such popular software as *Print Shop* and *Loderunner,* Brøderbund has announced and released a number of new programs for a variety of computers.

Heavily supporting the Apple IIGS, Brøderbund has converted its bestseller *Print Shop* and its animation program *Fantavision* to the Apple IIGS. Both packages take advantage of the GS's impressive graphics and increased memory, and will retail for $59.95 when they debut in the fall. Other Apple IIGS products include *Geometry* ($99.95), a conversion of the acclaimed mathematics tutorial originally for the Macintosh; and a new package, *ShowOff* ($59.95), a presentation graphics program for creating all types of transparencies, charts, graphs, and video slide shows.

Brøderbund's first foray into the Atari ST market is the ST Director Series—actually a two-progam set composed of *Art Director,* a powerful paint program, and *Film Director,* a simple-to-use animation package for creating slide shows or animations. Special tools do most of the repetitive drawing required for animation. Price for the ST Director Series is $79.95 for both. Another Brøderbund ST release is *Karateka,* which has recently been converted to the Atari ST. This $34.95 martial-arts adventure takes advantage of the ST's color, resolution, and computing power.

Another creation from the authors of *Ancient Art of War* is Brøderbund's new *Ancient Art of War at Sea* ($44.95, IBM, Tandy, and compatibles). This strategy game includes 11 ready-to-use naval campaigns, based on the most famous sea battles in history. Players' opponents include five of the world's best naval tacticians. Once the game's been mastered, players

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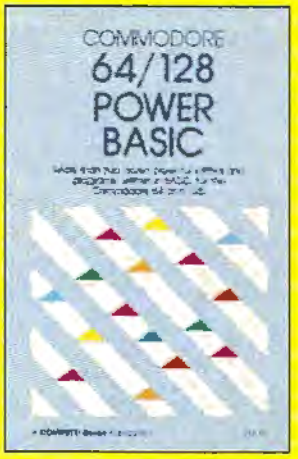

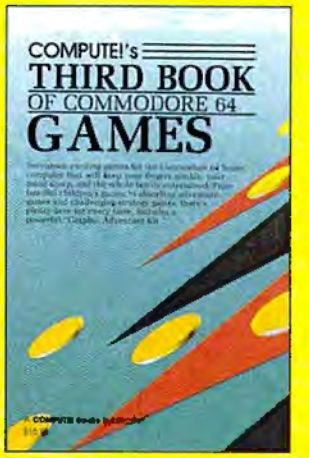

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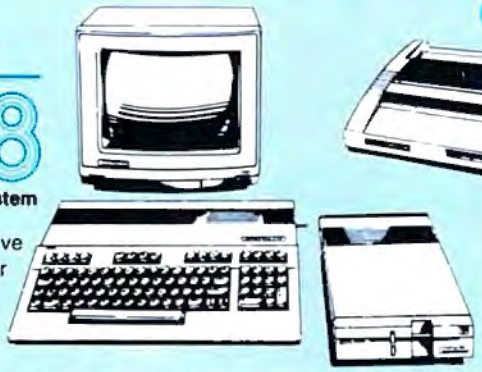

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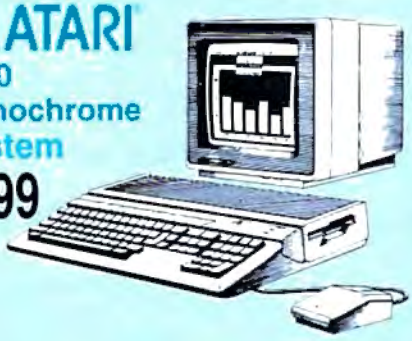

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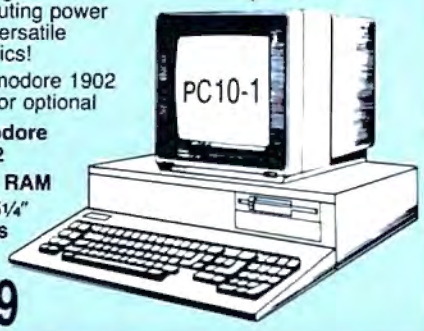

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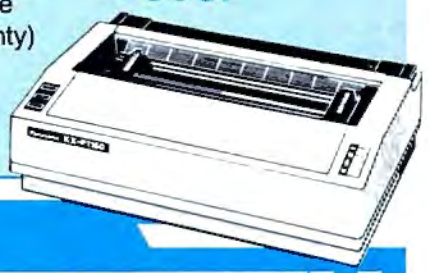

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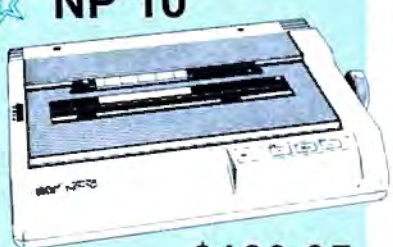

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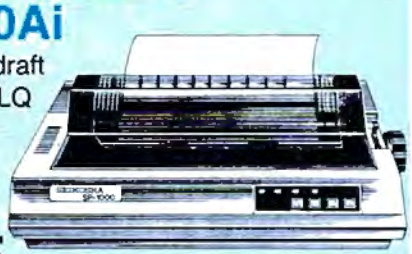

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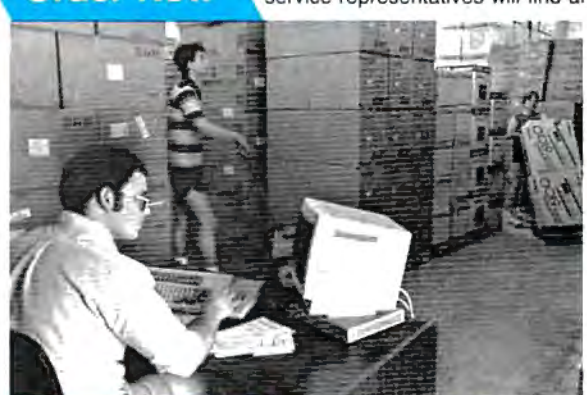

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can turn to the Game Generator, which lets them design custom battle scenes.

The company's new Macintosh products are in the Sensei Software series of math and science learning software. Two new entries following the bestselling *Geometry* are *Calculus* and *Physics*. Like *Geometry*, these programs let students of all ages learn at their own pace, and cover an entire year's material. Both packages retail for $99.95 each.

Not forgetting the Commodore 64, Brøderbund is making the bestselling British arcade games *Cauldron* and *Cauldron II* available in one package for $29.95.

Brøderbund is also reducing prices on a number of its older packages and pricing them in its new line of "Value Priced Software." Arcade games such as *Lode Runner* and *Choplifter!* and productivity software such as *Bank Street Speller* and *Bank Street Mailer* are being offered at prices ranging from $14.95 to $29.95.

Brøderbund Software, 17 Paul Dr., San Rafael, CA 94903

Davidson & Associates. This educational software company announced two new programs: *Read 'n Roll*, a reading comprehension program for grades 3–6 that contains 320 reading passages with comprehension questions; and *Math Blaster Plus*, an entirely new version of the popular *Math Blaster* program for grades 1–6, containing more than 750 basic math facts and five learning activities. Both will be available for the Apple II and IBM PC and compatible computers for $49.95 each.

Davidson & Associates, 3135 Kashiwa St., Torrance, CA 90505

Electronic Arts. Electronic Arts is introducing a number of new products, ranging from entertainment software to personal productivity packages. In its tradition of offering programs for almost every popular microcomputer system, the new releases are available for the Commodore Amiga, Atari ST, Apple IIGS, IBM PC, Macintosh, Commodore 64, and others.

New entertainment software includes such programs as the fantasy adventure game *Legacy of the Ancients* ($29.95, Commodore 64); *Ferrari Formula One*, a racing simulation ($49.95, Amiga); a multilevel flight simulator, *Chuck Yeager's Advanced Flight Simulator* ($39.95, IBM and compatibles); an action and strategy sports game, *Earl Weaver Baseball* ($49.95, Amiga); and a strategic space simulation, *EOS: Earth Orbit Stations* ($34.95, Apple II and Commodore 64).

New graphics packages are highlighted with the recent release of *Deluxe Paint II* for the Apple IIGS ($99.95). A professional-quality graphics program, *Deluxe Paint II* offers more than 90 painting tools and effects. Three collections of color clip art—*Art Parts, Volume 1; Art Parts, Volume 2;* and *Seasons and Holidays*—each contain more than 100 images for use in *Deluxe Paint II*. Price for each Apple IIGS clip-art collection is $29.95.

Other graphics programs include an enhanced and expanded version of *Deluxe Video* for the Commodore Amiga ($129.95). *Deluxe Video 1.2*'s new features include Overscan for an edge-to-edge TV screen look, Interlace for broadcast quality recording, and a faster frame rate for animation and scrolling.

Instant Page is Electronic Arts' entry into the form and newsletter-generation market. Available in September for the IBM and compatibles ($49.95), *Instant Page* doesn't require a graphics card, it accepts text from most major word processors, and it formats in multiple columns. Forms, charts, newsletters, signs, and brochures can be quickly created with the menu-driven program. Over 100 ready-to-use forms and newsletter templates are included.

EA also makes microcomputer music with two new entries. *Instant Music* is now available for the Apple IIGS ($49.95), a multilevel program of digitized instruments. *It's Only Rock'N'Roll* and *Hot & Cool Jazz* ($29.95 each)—two new library disks—offer dozens of new instruments and songs for *Instant Music* fans. *Music Construction Set* for the Atari ST ($39.95) is scheduled for a July release. This popular program, available for a wide variety of computer systems, takes advantage of the ST's unique MIDI capabilities and point-and-click interface.

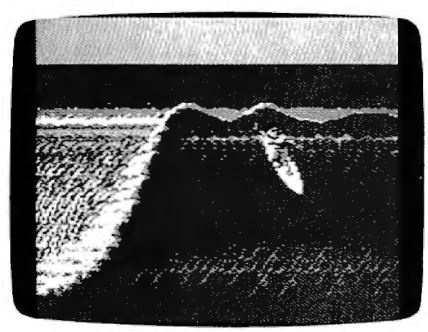
Two new typing tutors have been announced by EA—*IntelliType*, a program for adults which teaches typing in 30 days ($49.95, Amiga); and *Mavis Beacon Teaches Typing*, a graphics-intensive tutor for people of all ages ($39.95, IBM and compatibles, Commodore 64/128, Atari 800 series, Apple II series; and $49.95, Macintosh, Atari ST, and Amiga).

Other Electronic Arts releases are *Thunder 1.1*, an upgraded spelling checker for the Macintosh, and *What They Don't Teach at Harvard Business School*, a new business learning package based on the bestselling book. For the IBM and compatibles ($49.95, June) and Macintosh ($49.95, Fall 1987).

Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404

Epyx. Building on the success of their *World Games* series, Epyx attracted a lot of CES attention with the introduction of *California Games*, a laid-back round-up of West Coast skills including half-pipe skateboarding, hacky-sack (footbag), BMX stunt bicycle riding, surfing, roller skating, and Frisbee-type toss. The game will be released for Commodore, Apple II family, and IBM compatibles in the third quarter of 1987, with Amiga and Apple IIGS introductions planned for the fourth quarter. Prices are to be announced.

Street Sports Baseball inaugurates a new line of urban athletics for Epyx, adding backlot features such as tree stumps and bushes, as well as a trash-can lid that serves as home plate. The game also has 16 identified characters, each with a particular skill; players can select their own teams or can allow the computer to make the selection.



Surfing is only one of the activities in Epyx's new California Games. *Also featured are BMX stunt bicycles, flying disk competitions, rollerskating, footbags, and half-pipe skateboards.*

Street Sports Baseball will be available for Commodore, Apple II, and IBM compatibles this summer, with a price that is to be announced.

Omnicron Conspiracy was introduced as the second in Epyx's Masters Collection, aimed at experienced computer gamers. The new package offers a science-fiction scenario as players take the role of an officer in the Star Police, assigned to unravel the mystery of a starship displaced farther than is possible by known technology. Among the investigative tools at the player's disposal are a reference library, a droid named PAL, a planet-sized computer, and the members of a cult of psychics, all accessible through icons by way of joystick or cursor. *Omnicron Conspiracy* will be available in the fall for Commodore, Apple II–series, and IBM-compatible computers; the price will be announced upon delivery.

Epyx's new midprice line, *Maxx-Out*, will be launched with three packages, including *Rad Warrior, Boulder Dash Construction Kit,* and *Spy Vs. Spy III: Arctic Antics. Rad Warrior* challenges players to destroy an alien invader in a radioactive world of the future; the game will be available for Commodore, Apple II–series, and IBM-compatible machines in the third quarter of 1987. *Boulder Dash Construction Kit* permits users to customize their own tunnels, caves, and treasures, and will be available for Commodore, Apple II–family, Atari 800/130 and ST, and IBM-compatible machines. *Spy Vs. Spy: Arctic Antics* pits the familiar spies against each other and a frozen backdrop; the game will be sold in formats for Commodore, Apple II–series, IBM compatibles, and Atari 800/130 and ST systems. Prices are to be announced.

Print Magic is designed to be a graphics tool program for Apple II–series and IBM-compatible computers. Available in the third quarter of this year, *Print Magic* will include a variety of fonts, borders, and graphics, as well as drawing and painting tools and patterns for customizing images. Until December 31, 1987, Epyx will include a special disk of holiday images with each *Print Magic* at no extra charge.

Epyx, 600 Glaveston Dr., Redwood City, CA 94063

Firebird. With its *Universal Military Simulator (UMS),* Firebird provides Atari ST owners with the capability to create their own battles, configuring terrain, weaponry, and combatants from throughout history, as well as fantasy and science-fiction battles. Included in the program are historically accurate recreations of six significant battles; another feature is a display which shows the gamer the actual calculations made as the computer determines the results of conflict. *UMS* will be available in July at a suggested retail tag of $49.95.

Knight Orc puts players in the role of an orc, a mythical bird which, in this scenario, is oppressed by evil humans. The game is illustrated, possesses a 1000-word vocabulary, and will be released in late summer for Commodore machines including the Amiga, as well as for the Atari ST, the Apple II family, Macintosh, and IBM compatibles; suggested retail is $39.95 for the Commodore version and $44.95 for all other formats.

Martial arts on the ST is the promise of Firebird's *Golden Path,* in which players take the part of a wise man who must overcome obstacles and challenges while on a mystical quest. Clues are delivered in the form of a book of lore that appears as an onscreen window, and continues to give clues to help the player solve the game's central puzzle. The ST version is available for $44.95, with future releases planned for Commodore, Apple II, and Amiga machines.

The Advanced OCP Art Studio is a graphics program that provides users with 16 pens, 16 user-definable brushes, eight random sprays, and three levels of zoom and magnification, as well as a font editor, rotation and enlargement capability, cut and paste, and other graphics/desktop publishing options. The program will be available for $39.95 in Commodore format, and $44.95 for the Atari ST version.

Firebird Licensees, P.O. Box 49, Ramsey, NJ 07446

Gessler Educational Software. With *Battle of Words,* available in French, German, and Spanish, Gessler offers a five-part arcade-style program aimed at increasing student vocabulary and speed of translation. Priced at $49.95, the program is available for the Commodore 64, Apple II family, and PC compatibles.

French Micro Scrabble adapts the classic word-building game for competition in French either against the computer's 20,000-word vocabulary, or against other players. The game is available for $39.95 for the Commodore 64, Apple II family, and IBM-compatible computers.

Gessler Educational Software, 900 Broadway, New York, NY 10003

Infocom. The master storytellers at Infocom are at it again, with two new text adventures for all major computer systems: *Stationfall,* a sequel to the popular *Planetfall* comic adventure, both created by Steve Meretzky (who also collaborated with Douglas Adams for the Infocom hit, *Hitchhiker's Guide to the Galaxy*); and *The Lurking Horror,* Infocom's first venture into interactive horror fiction, a fearful cross between Stephen King and H.P. Lovecraft that was designed by Dave Lebling (coauthor of the *ZORK* series).

Infocom, 125 CambridgePark Dr., Cambridge, MA 02140

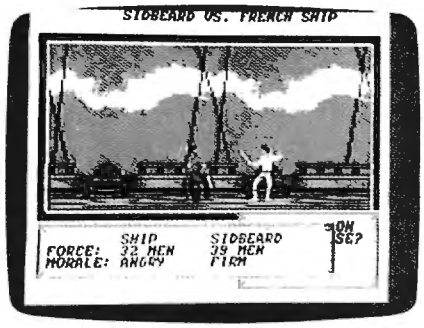
Inkwell Systems. The makers of the *Flexidraw* high-resolution graphics program (recently enhanced in Version 5.5) for Commodore 64 computers announced several new products, including the September release of *Flexidraft* ($499.95), a drafting program driven by a light pen for PCs and compatibles that's coupled with the model 184-1 light pen and the Pixel Port enhanced light pen interface card.

Inkwell also announced the availability of two new light pens: the model 170-C ($99.95), a new version of the industrial-quality light pen Inkwell has up to now bundled with the *Flexidraw* graphics program; and the model 184-C ($59.95), a new light pen featuring surface-mount technology, two-touch surface switches, and an ergonomic design. Both light pens are designed to be plug compatible with the Commodore 64 family of computers and the Amigas, and they also come with additional pinout information for use with IBM, Tandy, and other PC compatibles.

Inkwell Systems, P.O. Box 85152

MB290, 5710 Ruffin Rd., San Diego, CA 92138

MicroProse. *Pirates*, an adventure/simulation game for the Commodore 64, puts players in the Caribbean during the seventeenth century. Sailing, naval combat, land battles, sword fights, trading, smuggling, and more are a part of this latest creation by Sid Meier, designer of such software hits as *F-15 Strike Eagle* and *Silent Service*. State-of-the-art graphics and player-selected scenarios are a couple of the features of *Pirates*. IBM and Apple II versions are planned, though not announced.



Pirates, new from Microprose, recreates the Caribbean during the seventeenth century. The game is both a text and an arcade-style adventure, with historical detail in both segments.

Other new Commodore 64 products include *Project Stealth Fighter* ($39.95), a flight and combat simulator based on the super secret new Air Force aircraft that evades detection; and *Airborne Ranger* ($34.95), an arcade game in which players take the role of a Ranger behind enemy lines. Both products are scheduled for a late-summer to fall release.

Gunship, the attack helicopter simulator, has been converted to the IBM and compatibles. The game offers realistic flight characteristics, filled, solid-object 3-D graphics, and numerous combat mission scenarios. It even adjusts its speed to take advantage of the computer. The faster a machine operates, the smoother the flight and animation. Price is $49.95 retail.

Microprose anticipates an early 1988 introduction of *Red Storm Rising*, a game based on the popular book by bestselling author Tom Clancy, who is playing a part in the game's development. Late this year the company is expected to announce a complex, far-future, science-fiction game called *Space*.

MicroProse Software, 120 Lakefront Dr., Hunt Valley, MD 21030

Mindscape. Mindscape has been moving aggressively in both the entertainment and educational arenas in recent months, and has announced a number of new products for the remainder of the year.

In January, the company was purchased from its parent corporation, SFN Companies, by Mindscape Chairman John Purcell and Mindscape President and CEO Roger Buoy. Within the past year, Mindscape has acquired the products of software companies Scarborough Systems, Learning Well, and CBS Interactive Learning. The acquisitions have made Mindscape an even bigger player in both the education and entertainment fields.

Among the new products Mindscape announced recently are *Superstar Ice Hockey*, a complete hockey action simulation for one or two players, for the IBM PC and compatibles for $34.95 (already available for the Commodore 64 and Apple II family); *Understanding the United States Constitution* ($49.95), a program that helps students learn about and understand the Constitution (Spanish-language version on flip side), for the Apple II family (48K minimum); *Into the Eagle's Nest*, a World War II combat arcade game for the Commodore 64 ($29.95) immediately, and for PCs, Amigas, STs, and Apple IIs later in the year; *Plutos* ($29.95), a space war action game with superb graphics for the Atari ST; *Bop'n Rumble* ($29.95), a comic action game in which you save all the grannies from the vicious elements in the city, for Commodore 64 initially; and *Q-Ball*, another ST action program.

Mindscape, 3444 Dundee Rd., Northbrook, IL 60062

Okidata. Okidata announced a universally compatible dot-matrix printer, the Okidata 180, designed for either home or office use, with a suggested retail price of $329. With standard Commodore serial and Centronics parallel interfaces, the Okidata 180 is compatible with all the major personal computers available to home users, without having to add separate interface modules. The printer supports all Commodore and Epson control codes, insuring compatibility with all major software packages for the home. The 180 has print speeds of 180 characters per second (cps) in draft mode, 120 cps in utility mode, and 30 cps in near-letter-quality mode.

The new $329 Okidata 180 printer is compatible with all major personal computer systems.

Okidata, 532 Fellowship Rd., Mount Laurel, NJ 08054

QuantumLink. This Commodore 64-specific telecommunications service announced the introduction of four multiplayer casino games that will allow people across the country to play against one another.

The four games, which are packaged on one disk, require the use of a Commodore 64 or 128 computer, modem, telephone, and QuantumLink service. They will be available this fall at $14.95 for the disk, and include blackjack, poker, bingo, and slot machines.

QuantumLink, 8620 Westwood Center Dr., Vienna, VA 22180

Simon & Schuster. Hoping to capitalize on the 300,000 plus sales of *Typing Tutor III*, Simon & Schuster announced *Typing Tutor IV*, along with *Speed Reading IV*, two tutorials that allow users to customize their lessons and track their progress at both typing and speed reading.

With *P&L*, the company introduces a spreadsheet for nonfinancial managers. *P&L* uses traditional financial and business forms such as income statements rather than matrices, and can seek goals in more than 20 different areas of financial analysis.

Farther down the road, Simon & Schuster will be introducing a third text-oriented *Star Trek* game, which will borrow features from the two different modes of its earlier *Trek* texts. Also on the horizon is *Star Trek: The Rebel Universe*, the company's first graphics-oriented

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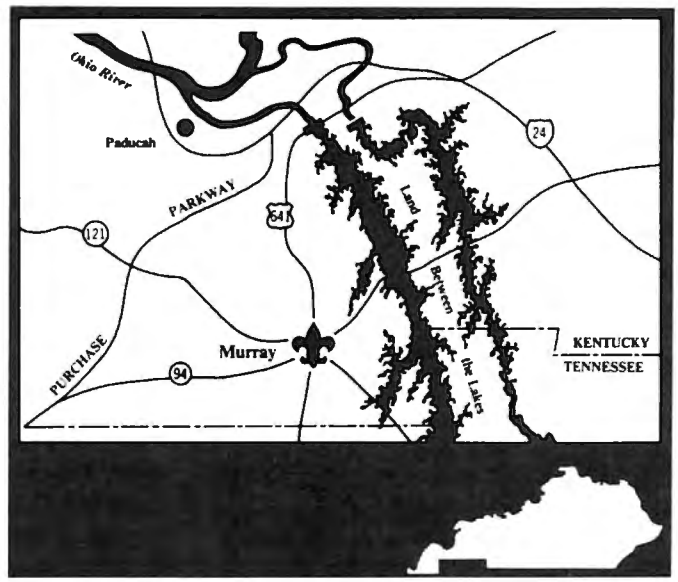

For more information write: ***The National Museum of the Boy Scouts of America, Murray State University, Murray, Kentucky 42071,***
Or call (502) 762-3383

Star Trek package, and their first game to be configured for the Amiga and the ST.

Simon & Schuster Software, 1 Gulf & Western Plaza, New York, NY, 10023

Spectrum HoloByte. Spectrum HoloByte recently released its Atari ST desktop publishing program, *Fleet Street Publisher*. Full-page composition, multiple columns, text editing, and picture sizing are all offered with *Fleet Street*. Text can be imported from any ASCII word processing file or entered directly, while graphics can be brought into a page from *Neochrome, Degas,* and other software or scanners. Priced at $119.95, the program will soon offer laser printer drivers for such printers as the HP Laserjet and *PostScript*-compatible printers.

In the entertainment/simulation area, Spectrum HoloByte will soon make available *Falcon*, an F-16 jet fighter simulator for the Macintosh. Detailed instrumentation, accurate flight characteristics, and multilevel combat are just some of the features of this flight-and-fight simulator. Price for *Falcon* has not been set.

Spectrum Holobyte, 2061 Challenger Dr., Alameda, CA 94501

Springboard Software. The publisher of the popular *Newsroom* and *Certificate Maker* software is readying its newest entry in the personal publishing market, *Springboard Publisher*. Expected release date is mid-September.

This desktop publishing program for the Apple IIe, IIc, and IIGS allows for total text, graphics, and layout control on a single screen. With a built-in word processor, simplified graphics import functions, and automatic wrapping of text around any graphics, *Springboard Publisher* has all the tools necessary to create a professional-looking publication. Price is set at $139.95. Printing can be done on almost any dot-matrix printer or with the optional *Laser Driver* ($39.95), on a *PostScript*-equipped laser printer.

Slated for release at the same time as *Springboard Publisher* are three volumes in the *Works of Art* clip-art collection ($39.95 each). More than 500 pieces of art are included in each package. *Springboard Publisher Style Sheets* ($29.95), with predesigned page layout style sheets, will also be available at *Springboard Publisher*'s release.

An MS-DOS version of *Springboard Publisher* is planned, though a schedule hasn't been set.

Springboard Software, 7808 Creekridge Cir., Minneapolis, MN 55435

SSI. Strategic Simulations announced the release of *President Elect—1988 Edition*, a $24.95 strategic simulation game of presidential politics for Apple, Commodore 64, and PCs and compatibles. A previous version of this game was released prior to the 1984 presidential race, and the current game lets you make a contest of every bout for the top spot from 1960 through 1988. Owners of the original version can receive the new game for just $10 plus $2 shipping and handling by sending in the old disk.

SSI is also introducing *B-24*, a $34.95 flight and combat simulator for Apple, Commodore 64, and PCs and compatibles; *Rebel Charge at Chickamauga* ($49.95), a sophisticated simulation of one of the South's major offensives during the Civil War, for Apple, Atari, 64, and PCs/compatibles; and *The Eternal Dagger* ($39.95), a sequel to SSI's popular *Wizard's Crown* fantasy adventure game, for Apple, Atari, and Commodore 64.

SSI, 1046 N. Rengstorff Ave., Mountain View, CA 94043

Three-Sixty. This new computer games company, founded by former Accolade head Tom Frisina, has announced that it will offer a variety of new entertainment programs for the major computer systems, starting with the Commodore 64, Atari ST, Amiga, and IBM PC/compatibles versions of *Dark Castle*, the graphics adventure that has been very popular in Macintosh form from Silicon Beach Software. An Apple IIGS version will be available in early 1988.

Three-Sixty, 2105 South Bascom Ave., Campbell, CA 95008

Thunder Mountain. This budget software line, a division of Mindscape, offers almost 50 different titles of educational and entertainment software at a suggested retail price of $9.95 each. Among the newest additions to the list are *Top Gun*, an arcade action game based on the popular movie, for Commodore 64 and PCs and compatibles; and *Rock 'N' Roll Trivia*, a five-volume set of music trivia questions for Commodore 64 and PCs and compatibles, including on each disk over 1000 questions and answers with six different musical categories and three levels of play.

Mindscape, 3444 Dundee Rd., Northbrook, IL 60062

Timeworks. Timeworks has released and announced a number of productivity software packages for a broad range of computers.

The Timeworks Desktop Publisher—with versions for IBM and compatibles, Apple II, Atari ST, and Commodore 64/128—is scheduled for release this year. With word processing, page design, drawing tools, and high-resolution graphics, this program offers ease of use and sophistication. Prices have not been announced.

Other new Timeworks' offerings include *Partner ST* ($69.95, Atari ST), a desktop accessory program with such features as an appointment calendar, memo pad, auto dialer, calculator, and more; *Sylvia Porter's Personal Investment Manager* ($149.95, IBM PC, PC compatibles, and Apple II), volume 2 in the series of personal financial management software; *PC Quartet* ($149.95, IBM and compatibles), with four full-featured applications, including a word processor, spreadsheet, database, and telecommunications; *DOS University* ($79.95, IBM PC and compatibles), a combination disk manager, file recovery, file security, and disk optimizing package; and *The Ultimate Word Writer PC* ($149.94, IBM PC and compatibles), a sophisticated word processor with three built-in spelling checkers, an integrated thesaurus, style checker, column editing, and more.

Timeworks, 444 N. Lake Cook Rd., Deerfield, IL 60015

The following editors contributed to this story: Selby Bateman, Tom Halfhill, and Gregg Keiser.

Information on additional products announced at CES can be found in "News & Products" on page 112.

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Climber 5

James Rogers

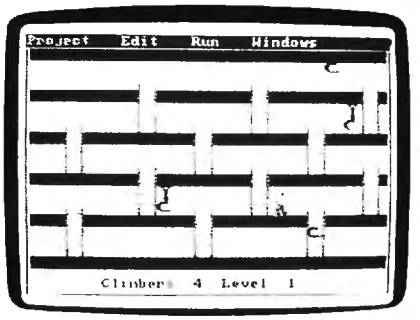
This fast-moving arcade game is right in season. As ballboy for a baseball team, it's your job to retrieve a home-run ball from the top of a nearby building. Time is of the essence, but you still need to avoid moving obstacles on your way to the top. The Atari and Commodore 64 versions require a joystick. The Atari version also requires a disk drive. The Amiga version requires at least 512K of memory. The IBM PC/PCjr version requires BASICA or GW-BASIC and a color/graphics adapter for the PC and compatibles, and Cartridge BASIC for the PCjr. The Apple II version runs under either DOS 3.3 or ProDOS.

"Play ball," the umpire cries, and the game begins. As ballboy for the home team, your job is easy: Retrieve stray balls and return them to the umpire. The number 5 on the back of your uniform shows that you're part of the team, and your job is more important than some might think, since it so happens that this game is being played with only one baseball. If a ball flies into the stands or out of the park, the game grinds to a halt while a stadium full of fans and players waits for you to bring it back.

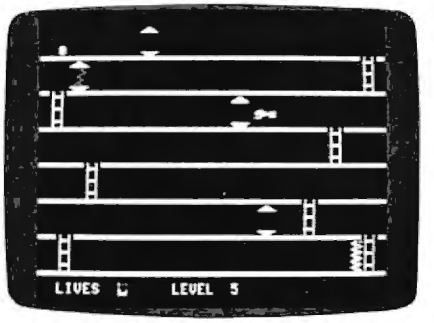
You're used to the pressure, but that doesn't make the waiting any easier. The first inning passes, followed by the second and third, without any problem. Then, at the top of the fourth inning, the first batter swats a towering homer over the left-field wall. Up, up it goes, so high that you grab your field glasses to track it. Yes, it's outside the stadium—looks like a long sprint to get it back. Oh, no! Did that really happen? The ball lodges at the top of a neighboring building which is still under construction. As you rush to retrieve the prize, you'll have to duck and dodge to avoid obstacles on the construction site.

The original version of "Climber 5" is written for the Atari 400, 800, XL, and XE computers. We've added new translations for the Commodore 64, Amiga, Apple II series, and IBM PC/PCjr and compatibles. Type in the version for your computer and save a copy; then run the program.

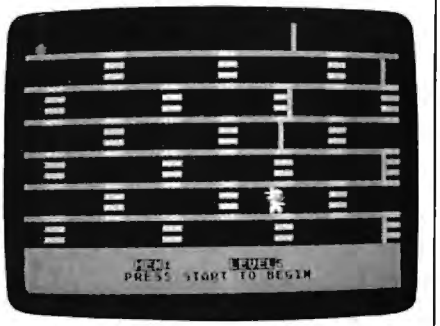
The Climber 5 screen consists of several horizontal levels. When the game begins, you are at the bottom right corner of the screen, and the ball is at the upper left. Your job is to climb and run to where the ball lies, avoiding all the moving obstacles along the way. Since some of the moving objects are speedy indeed, that's more difficult than you might imagine at first. You can move left or right with the joystick or keyboard controls, depending on what version



"Climber 5" for the Atari 400, 800, XL, and XE is a fast-action arcade game in a novel setting.



The Commodore 64 version of "Climber 5" requires you to avoid moving sweepers and electrodes.



The shapes for the Amiga version of "Climber 5" were drawn with Deluxe Paint and converted for use in BASIC.

you're playing.

Each level is connected to the next by one or more ladders. The joystick or keyboard controls allow you to move up or down a ladder; of course, you must be aligned with the ladder in order to ascend or descend on it.

You have a total of five players when the game begins. Whenever you hit a moving object, you lose one player. The game ends when you have lost all your players. If you reach the ball without being hit, the program displays a congratulatory message and lets you try the next skill level, where everything becomes more difficult.

Atari 400, 800, XL, And XE Version

Since the Atari version is written entirely in machine language, special steps are required to run the program. Program 1 is a BASIC program that creates a binary file on disk containing the machine language data for Climber 5. Type in Program 1 and save a copy before you run it. If an error is detected in the DATA statements, you'll see a message to that effect; otherwise, a file named C5.OBJ will be written to disk. Once you have created this file, you don't need to run Program 1 again except to create new copies of the binary file.

With one of the Atari versions of DOS, you load the game by entering the DOS menu and using the L option to load the binary file (C5.OBJ). You then use DOS option M to begin executing the program. Specify 4000 as the execution address. If you use DOS XL, OS/A+, or a similar alternative DOS, you can start the game simply by typing C5.OBJ at a DOS prompt.

A joystick is required to play this game. Press START to begin the game or to restart it when a game is over.

Commodore 64 Version

The Commodore 64 version of Climber 5 (Program 2) is written in machine language and must be entered with the "MLX" machine language entry program printed elsewhere in this issue. Here are the addresses you need to type in the program with MLX:

Starting address: 0801
Ending address: 1500

After you have typed in all the data from Program 2, be sure to save a copy before you leave MLX.

Although the program is written in machine language, it can be loaded and run like a BASIC program. This version requires a joystick. Plug the joystick into port 2. The objects to be avoided are sweepers and moving electrodes. You can jump through an electrode, but the sweepers must be avoided at all costs. Press the joystick button to jump. There are five different buildings to climb. Objects come only from the left in the first five levels, and from both directions on higher levels. You can pause the game temporarily by holding down the SHIFT key. For longer pauses, use the SHIFT LOCK key.

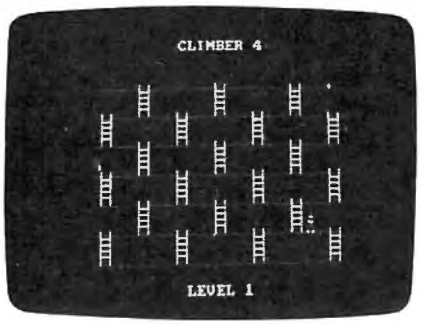
Amiga Version

The Amiga version of Climber 5 (Program 3) requires 512K of memory and it is played with keyboard controls. In this game you must avoid moving hooks of various sizes. The short hooks may be evaded by ducking down (press the down cursor key to duck).

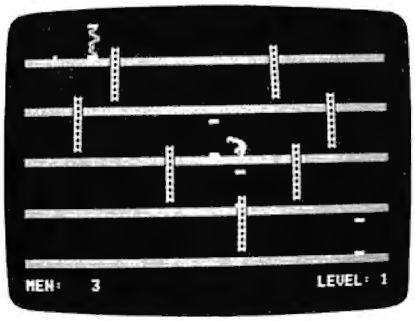
The shapes for the animated climber and moving hooks were first drawn with *Deluxe Paint* and then converted for BASIC with the "IFF Translator" program published in the April, 1987 issue of COMPUTE!. A simple compression algorithm is used to reduce the amount of shape data you need to type in. The subroutine ReadCompressed handles data for one shape each time it is called. Data elements with a value less than 40000 are stored directly in the shape array. Any number greater than 40000 represents a group of zero values. The routine subtracts 40000 from the value to determine how many zeros to place in the array. For instance, the number 40015 means that we need to put 15 zeros in the array. The number 40000 is used because a normal shape data value would never be greater than 32768. One reason the shape data contains many zeros is that not all the colors are used in every shape.

IBM PC/PCjr Version

Climber 5 for the IBM PC/PCjr (Program 4) requires BASICA or GW-BASIC and a color/graphics card for the PC and compatibles, and Cartridge BASIC for the PCjr. Use the cursor keys on the numeric keypad to move left, right, up, and down. In this version, the ball begins at the upper right of the screen and moves left as you move to higher skill levels. The number in the title at the top of the screen indicates how many players you have left.



IBM PC/PCjr version of "Climber 5" is an amusing action game.



The animated climber makes a somersault in the Apple II version of "Climber 5."

Apple II Version

The Apple II version of Climber 5 (Program 5) runs on any Apple II series computer, under either DOS 3.3 or ProDOS. Because the program is written in machine language, it must be entered with the Apple version of the "MLX" machine language entry program found elsewhere in this issue. Before you load MLX, you must take a special step to protect the Climber 5 data while it is being entered. Enter the following line in immediate mode (without a line number) before loading MLX:

```
POKE 104,32: POKE 8192,0: NEW
```

If you enter the program in multiple sessions, remember to enter this line each time before loading MLX.

When you run MLX, you'll be asked for a starting address and an ending address for the data you'll be entering. For Climber 5, use the following values:

```
STARTING ADDRESS?    0C00
ENDING ADDRESS?      1EBF
```

After you have entered all the data, be sure to save a copy before leaving MLX.

To start the game, use a command of the form **BRUN** *filename*, where *filename* is the name you used for the Climber 5 data. The game is played with keyboard controls. Press the I, J, K, or L keys to move up, left, down, or right, respectively. In this version, you can avoid objects by leaping straight up or by somersaulting to the left or right. Press the U or O key to somersault left or right, respectively. Press the space bar to jump straight up.

Program 1: Atari Climber 5

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
MO 1  REM COPYRIGHT 1987 COMP
      UTE! PUBLICATIONS, INC.
       ALL RIGHTS RESERVED.
AO 2  PRINT "{CLEAR}COPYRIGHT
       1987":PRINT "COMPUTE!
      PUBLICATIONS, INC.":PRI
      NT "ALL RIGHTS RESERVED
      .":? "{3 DOWN}CREATING
      FILE."
EC 3  FOR H=1 TO 2355
FB 4  READ A:CK=CK+A:NEXT H
MO 5  IF CK<>263962 THEN PRIN
      T "TYPING ERROR":END
OL 6  OPEN #1,8,0,"D:C5.OBJ"
KE 7  RESTORE :FOR H=1 TO 235
      5
EK 8  READ A:PUT #1,A:NEXT H
HM 10 DATA 255,255,0,64,251,
      64,32,122
ID 20 DATA 72,165,106,56,233
      ,16,141,7
LH 30 DATA 212,141,165,6,169
      ,62,141,47
IJ 40 DATA 2,169,3,141,29,20
      8,173,165
BJ 50 DATA 6,24,105,3,133,20
      8,169,0
EJ 60 DATA 133,207,162,5,160
      ,0,169,6
HB 70 DATA 145,207,200,208,2
      49,230,208,202
IH 80 DATA 208,242,173,165,6
      ,24,105,6
PC 90 DATA 133,208,169,28,13
      3,207,162,7
KL 100 DATA 142,166,6,160,0,
       162,20,169
EA 110 DATA 3,145,207,200,20
       2,208,248,165
EF 120 DATA 207,24,105,24,13
       3,207,174,166
BF 130 DATA 6,202,208,228,23
       0,208,169,40
OF 140 DATA 133,207,162,8,16
       0,0,185,192
HK 150 DATA 65,145,207,200,2
       02,208,247,173
KP 160 DATA 165,6,24,105,4,1
       33,204,173
LI 170 DATA 165,6,24,105,5,1
       33,206,169
HO 180 DATA 0,141,8,208,141,
       9,208,141
NG 190 DATA 10,208,141,11,20
       8,141,8,210
BA 200 DATA 169,3,141,15,210
       ,169,134,141
LH 210 DATA 192,2,169,62,141
       ,193,2,169
BL 220 DATA 92,141,194,2,169
       ,120,141,195
IH 230 DATA 2,169,154,141,19
       6,2,169,0
LN 240 DATA 141,197,2,169,60
       ,141,198,2
LA 250 DATA 169,0,141,200,2,
       169,19,133
FF 260 DATA 224,169,66,133,2
       25,169,50,141
HL 270 DATA 3,208,169,0,141,
       221,6,141
KO 280 DATA 222,6,169,33,141
       ,111,2,162
CO 290 DATA 7,160,0,169,0,15
       3,184,6
EG 300 DATA 200,202,208,247,
       32,177,67,160
OE 310 DATA 1,169,240,145,20
       7,160,8,162
DO 320 DATA 6,169,138,145,20
       7,200,200,200
DJ 330 DATA 200,200,252,64,2
       47,65,200,202
OO 340 DATA 208,243,169,158,
       141,0,2,169
IE 350 DATA 68,141,1,2,169,1
       92,141,14
PB 360 DATA 212,160,246,162,
       67,169,7,32
CO 370 DATA 92,228,32,177,67
       ,169,134,141
IJ 380 DATA 168,6,32,120,67,
       162,6,142
LL 390 DATA 166,6,160,0,162,
       20,169,255
KG 400 DATA 145,207,200,202,
       208,248,169,120
OM 410 DATA 141,168,6,32,120
       ,67,174,166
KO 420 DATA 6,202,208,227,16
       0,0,32,177
PB 430 DATA 67,169,138,141,1
       68,6,32,120
IP 440 DATA 67,169,3,141,171
       ,6,169,22
ME 450 DATA 141,172,6,32,188
       ,67,32,177
PE 460 DATA 67,169,255,141,1
       68,6,32,120
JG 470 DATA 67,169,4,141,171
       ,6,169,16
MY 480 DATA 141,172,6,32,188
       ,67,173,48
LG 490 DATA 2,24,105,41,133,
       207,173,49
HA 500 DATA 2,105,4,133,208,
       160,0,162
DP 510 DATA 15,185,201,65,14
       5,207,200,202
LJ 520 DATA 208,247,173,48,2
       ,24,105,44
LD 530 DATA 133,218,173,49,2
       ,105,4,133
LK 540 DATA 219,173,48,2,24,
       105,56,133
KM 550 DATA 220,173,49,2,105
       ,4,133,221
LD 560 DATA 173,48,2,24,105,
       80,133,222
IJ 570 DATA 173,49,2,105,4,1
       33,223,76
FP 580 DATA 198,68,24,24,60,
       60,60,60
II 590 DATA 60,24,24,173,165
       ,174,16,0
KF 600 DATA 0,0,0,0,0,172,16
       5,182
IJ 610 DATA 165,172,16,48,50
       ,37,51,51
KM 620 DATA 0,51,52,33,50,52
       ,0,52
CC 630 DATA 47,0,34,37,39,41
       ,46,121
GK 640 DATA 96,121,96,81,96,
       81,60,72
```

```
JI 650  DATA 72,60,248,65,243
        ,66,72,72
DC 660  DATA 47,47,53,53,60,6
        0,47,47
ED 670  DATA 72,72,81,81,47,4
        7,96,96
FN 680  DATA 108,108,47,47,12
        8,128,144,144
HI 690  DATA 121,56,124,127,1
        20,124,212,192
OB 700  DATA 230,96,0,252,220
        ,92,124,108
OI 710  DATA 108,72,108,56,12
        4,127,4,124
GI 720  DATA 46,62,24,28,56,2
        48,56,56
KN 730  DATA 124,108,108,0,0,
        56,124,127
BD 740  DATA 120,124,212,192,
        230,96,0,254
BO 750  DATA 254,60,62,126,10
        2,224,192,56
IJ 760  DATA 124,127,4,124,46
        ,62,24,28
AF 770  DATA 56,249,57,124,12
        6,122,96,96
BE 780  DATA 0,56,124,127,120
        ,124,212,192
DL 790  DATA 230,96,0,120,248
        ,124,62,126
BN 800  DATA 246,228,134,56,1
        24,127,4,124
IO 810  DATA 46,62,24,28,56,1
        24,212,68
IE 820  DATA 14,126,118,96,0,
        24,60,126
EO 830  DATA 126,126,126,126,
        60,60,126,255
EM 840  DATA 255,255,60,126,1
        26,126,102,24
HG 850  DATA 60,126,60,0,0,0,
        0,60
DP 860  DATA 102,110,102,52,3
        6,126,126,126
EN 870  DATA 102,56,124,124,1
        24,124,125,59
MD 880  DATA 127,254,252,248,
        254,127,127,127
LI 890  DATA 118,112,32,56,12
        4,124,57,1
CB 900  DATA 0,0,124,76,92,72
        ,110,79
OJ 910  DATA 127,127,118,112,
        32,28,62,62
OJ 920  DATA 62,62,190,220,25
        4,127,63,31
OK 930  DATA 127,254,254,254,
        110,14,4,28
BP 940  DATA 62,62,156,128,0,
        0,62,50
BI 950  DATA 54,18,122,242,25
        4,254,110,14
PD 960  DATA 4,28,62,254,30,6
        2,43,3
GC 970  DATA 103,6,244,66,239
        ,67,0,63
EA 980  DATA 59,58,62,54,54,1
        8,54,28
LO 990  DATA 62,254,32,60,116
        ,124,24,56
BL 1000 DATA 28,31,28,28,62,
        54,54,0
BC 1010 DATA 0,28,62,254,30,
        62,43,3
NF 1020 DATA 103,6,0,127,127
        ,60,124,126
EM 1030 DATA 102,7,3,28,62,2
        54,32,60
CA 1040 DATA 116,124,24,56,2
        8,159,156,62
CD 1050 DATA 126,94,6,6,0,28
        ,62,254
NH 1060 DATA 30,62,43,3,103,
        6,0,30
OL 1070 DATA 31,62,124,126,1
        11,39,97,28
OF 1080 DATA 62,254,32,60,11
        6,124,24,56
KN 1090 DATA 28,62,43,34,112
        ,126,110,6
DL 1100 DATA 0,0,36,0,72,0,3
        6,0
EK 1110 DATA 72,40,40,37,35,
        35,37,40
FF 1120 DATA 42,45,47,50,53,
        57,60,64
MA 1130 DATA 68,72,76,81,121
        ,96,121,81
BL 1140 DATA 121,72,165,207,
        24,109,168,6
MC 1150 DATA 133,207,165,208
        ,105,0,133,208
PL 1160 DATA 96,169,1,141,16
        8,6,172,169
LI 1170 DATA 6,162,7,173,213
        ,6,205,166
OH 1180 DATA 6,240,23,238,16
        6,6,202,208
BG 1190 DATA 242,173,166,6,2
        4,105,41,141
BK 1200 DATA 166,6,136,208,2
        28,169,0,141
LP 1210 DATA 168,6,96,173,48
        ,2,133,207
LJ 1220 DATA 173,49,2,133,20
        8,96,162,3
LG 1230 DATA 142,166,6,162,4
        ,142,167,6
GA 1240 DATA 174,171,6,169,8
        5,145,207,169
LA 1250 DATA 6,141,168,6,32,
        120,67,202
BO 1260 DATA 208,241,173,172
        ,6,141,168,6
BL 1270 DATA 32,120,67,174,1
        67,6,202,208
BI 1280 DATA 220,169,80,141,
        168,6,32,120
AB 1290 DATA 67,174,240,67,2
        35,68,166,6
EI 1300 DATA 202,208,201,96,
        72,138,72,152
EG 1310 DATA 72,165,224,24,1
        05,18,133,226
AI 1320 DATA 165,225,105,0,1
        33,227,160,0
EH 1330 DATA 162,18,169,0,14
        5,203,145,205
GP 1340 DATA 200,202,208,246
        ,173,212,6,133
EC 1350 DATA 203,133,205,160
        ,0,162,18,177
NL 1360 DATA 224,145,203,177
        ,226,145,205,200
BB 1370 DATA 202,208,244,173
        ,218,6,201,1
PJ 1380 DATA 208,53,238,219,
        6,174,219,6
EM 1390 DATA 224,4,144,5,169
        ,0,141,1
NJ 1400 DATA 210,224,5,144,3
        4,169,0,141
PF 1410 DATA 219,6,174,220,6
        ,189,237,65
AD 1420 DATA 141,0,210,169,1
        64,141,1,210
OG 1430 DATA 238,220,6,174,2
        20,6,224,38
LA 1440 DATA 144,5,169,0,141
        ,220,6,173
LC 1450 DATA 221,6,201,1,208
        ,38,169,42
ON 1460 DATA 141,3,210,174,2
        22,6,189,95
OG 1470 DATA 67,141,2,210,23
        8,222,6,173
LO 1480 DATA 222,6,201,19,20
        8,14,169,0
```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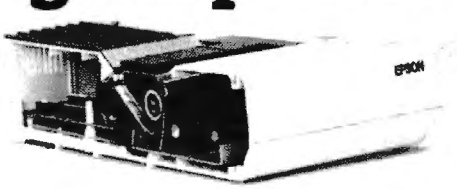

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```
KI 1490 DATA 141,222,6,141,2
        21,6,141,3
GD 1500 DATA 210,141,2,210,1
        04,168,104,170
CK 1510 DATA 104,76,98,228,7
        2,138,72,152
BB 1520 DATA 72,169,1,141,10
        ,212,172,164
LN 1530 DATA 6,185,184,6,141
        ,2,208,238
LI 1540 DATA 164,6,173,164,6
        ,201,7,144
LJ 1550 DATA 5,169,0,141,164
        ,6,104,168
EJ 1560 DATA 104,170,104,64,
        169,1,141,192
LO 1570 DATA 6,169,5,141,191
        ,6,141,218
PI 1580 DATA 6,169,160,141,1
        93,6,169,60
LB 1590 DATA 141,198,2,169,0
        ,141,200,2
BE 1600 DATA 160,0,162,20,18
        5,217,65,145
HK 1610 DATA 222,200,236,68,
        231,69,202,208
EP 1620 DATA 247,173,31,208,
        201,6,208,249
NK 1630 DATA 160,0,162,20,16
        9,0,145,222
HF 1640 DATA 200,202,208,248
        ,160,0,173,192
BN 1650 DATA 6,24,105,16,145
        ,220,169,174
BA 1660 DATA 141,212,6,169,2
        00,141,213,6
KE 1670 DATA 141,0,208,141,1
        ,208,160,0
LC 1680 DATA 162,4,169,0,153
        ,214,6,200
CA 1690 DATA 202,208,247,160
        ,0,162,7,169
OK 1700 DATA 42,153,184,6,14
        1,2,208,169
KL 1710 DATA 0,153,194,6,153
        ,204,6,200
BD 1720 DATA 202,208,236,160
        ,0,162,7,173
NB 1730 DATA 10,210,41,15,24
        ,105,40,153
KN 1740 DATA 204,6,200,202,2
        40,9,169,1
GO 1750 DATA 153,204,6,200,2
        02,208,232,160
LF 1760 DATA 0,173,191,6,24,
        105,16,145
MD 1770 DATA 218,169,1,141,2
        18,6,169,3
OE 1780 DATA 141,30,208,173,
        15,208,41,3
HD 1790 DATA 201,0,240,50,16
        9,0,141,0
BE 1800 DATA 208,141,1,208,1
        41,213,6,169
OE 1810 DATA 174,141,212,6,3
        2,40,72,238
LO 1820 DATA 192,6,173,193,6
        ,56,233,20
PA 1830 DATA 141,193,6,173,1
        98,2,105,62
OL 1840 DATA 141,198,2,173,2
        00,2,233,78
IE 1850 DATA 141,200,2,76,2,
        69,173,14
BG 1860 DATA 208,201,0,240,3
        9,173,14,208
OF 1870 DATA 201,8,240,32,16
        9,0,141,218
KI 1880 DATA 6,141,0,210,141
        ,1,210,169
LG 1890 DATA 1,141,221,6,206
        ,191,6,173
II 1900 DATA 191,6,201,0,208
        ,3,76,198
JC 1910 DATA 68,76,12,69,169
        ,3,141,30
OH 1920 DATA 208,169,0,141,2
        02,6,169,30
CF 1930 DATA 141,166,232,69,
        227,70,6,162
LN 1940 DATA 7,173,212,6,205
        ,166,6,208
LL 1950 DATA 5,169,1,141,202
        ,6,173,166
LD 1960 DATA 6,24,105,24,141
        ,166,6,202
BH 1970 DATA 208,231,169,1,1
        41,203,6,141
KJ 1980 DATA 211,6,173,202,6
        ,201,1,240
PF 1990 DATA 3,76,160,70,169
        ,30,141,166
KN 2000 DATA 6,162,4,173,212
        ,6,205,166
KN 2010 DATA 6,240,15,173,16
        6,6,24,105
BN 2020 DATA 48,141,166,6,20
        2,208,236,76
OJ 2030 DATA 117,70,169,0,14
        1,168,6,173
BG 2040 DATA 212,6,201,174,2
        40,13,169,77
LN 2050 DATA 141,166,6,169,3
        ,141,169,6
BL 2060 DATA 32,135,67,173,1
        68,6,141,211
LI 2070 DATA 6,169,0,141,168
        ,6,173,212
NM 2080 DATA 6,201,30,240,13
        ,169,53,141
JB 2090 DATA 166,6,169,4,141
        ,169,6,32
OI 2100 DATA 135,67,173,168,
        6,141,203,6
LJ 2110 DATA 76,160,70,169,1
        ,141,168,6
OO 2120 DATA 169,53,141,166,
        6,169,4,141
MF 2130 DATA 169,6,32,135,67
        ,173,168,6
OM 2140 DATA 141,211,6,169,7
        7,141,166,6
MA 2150 DATA 169,3,141,169,6
        ,32,135,67
BG 2160 DATA 173,168,6,141,2
        03,6,173,120
KL 2170 DATA 2,141,166,6,173
        ,202,6,201
IL 2180 DATA 1,240,3,76,74,7
        1,173,166
KN 2190 DATA 6,201,10,240,14
        ,173,166,6
MF 2200 DATA 201,11,240,7,17
        3,166,6,201
FC 2210 DATA 9,208,30,169,23
        5,133,224,169
BF 2220 DATA 66,133,225,173,
        213,6,201,47
NJ 2230 DATA 240,12,206,213,
        6,173,213,6
KO 2240 DATA 141,0,208,141,1
        ,208,76,19
OP 2250 DATA 71,173,228,70,2
        23,71,166,6
NN 2260 DATA 201,6,240,14,17
        3,166,6,201
FD 2270 DATA 7,240,7,173,166
        ,6,201,5
GD 2280 DATA 208,82,169,19,1
        33,224,169,66
HG 2290 DATA 133,225,173,213
        ,6,201,209,240
NM 2300 DATA 12,238,213,6,17
        3,213,6,141
KF 2310 DATA 0,208,141,1,208
        ,169,0,141
LA 2320 DATA 215,6,141,217,6
        ,172,214,6
EP 2330 DATA 165,224,24,121,
        87,67,133,224
HI 2340 DATA 165,225,105,0,1
        33,225,238,216
HK 2350 DATA 6,173,216,6,201
        ,3,208,20
LI 2360 DATA 169,0,141,216,6
        ,238,214,6
LI 2370 DATA 173,214,6,201,4
        ,208,5,169
KH 2380 DATA 0,141,214,6,173
        ,203,6,201
LC 2390 DATA 1,208,27,173,16
        6,6,201,10
NM 2400 DATA 240,14,173,166,
        6,201,6,240
IC 2410 DATA 7,173,166,6,201
        ,14,208,6
BK 2420 DATA 206,212,6,76,13
        9,71,173,211
II 2430 DATA 6,201,1,208,87,
        173,166,6
OA 2440 DATA 201,9,240,14,17
        3,166,6,201
IA 2450 DATA 5,240,7,173,166
        ,6,201,13
OO 2460 DATA 208,66,238,212,
        6,169,0,141
BO 2470 DATA 214,6,141,216,6
        ,169,127,133
FI 2480 DATA 224,169,66,133,
        225,172,215,6
FB 2490 DATA 165,224,24,121,
        91,67,133,224
HH 2500 DATA 165,225,105,0,1
        33,225,238,217
HJ 2510 DATA 6,173,217,6,201
        ,3,208,20
LI 2520 DATA 169,0,141,217,6
        ,238,215,6
LH 2530 DATA 173,215,6,201,4
        ,208,5,169
EE 2540 DATA 0,141,215,6,162
        ,0,160,7
OI 2550 DATA 189,194,6,201,0
        ,240,31,254
CK 2560 DATA 184,6,189,184,6
        ,201,209,144
CH 2570 DATA 21,169,224,71,2
        19,72,42,157
MM 2580 DATA 184,6,169,0,157
        ,194,6,173
KK 2590 DATA 10,210,41,63,24
        ,105,1,157
AN 2600 DATA 204,6,232,136,2
        08,214,162,0
LF 2610 DATA 160,7,189,194,6
        ,201,1,240
OB 2620 DATA 15,222,204,6,18
        9,204,6,201
FK 2630 DATA 0,208,5,169,1,1
        57,194,6
IA 2640 DATA 232,136,208,230
        ,172,193,6,162
LN 2650 DATA 34,202,208,253,
        136,208,248,169
JB 2660 DATA 0,133,77,76,113
        ,69,162,6
BL 2670 DATA 160,0,169,166,1
        41,3,210,185
OD 2680 DATA 114,67,141,2,21
        0,169,0,133
DF 2690 DATA 20,165,20,201,1
        0,144,250,200
AH 2700 DATA 202,208,231,169
        ,0,141,3,210
CD 2710 DATA 141,2,210,96,23
        4,162,96,169
MA 2720 DATA 12,157,66,3,32,
        86,228,162
AL 2730 DATA 96,169,119,157,
        68,3,169,72
GJ 2740 DATA 157,69,3,169,3,
        157,66,3
```

```
MD 2750 DATA 169,28,157,74,3
        ,169,5,157
KB 2760 DATA 75,3,76,86,228,
        83,58,155
MK 2770 DATA 162,96,169,12,1
        57,66,3,32
MH 2780 DATA 86,228,162,96,1
        69,119,157,68
BO 2790 DATA 3,169,72,157,69
        ,3,169,3
JC 2800 DATA 157,66,3,169,12
        ,157,74,3
JF 2810 DATA 169,1,157,75,3,
        32,86,228
BJ 2820 DATA 160,74,185,189,
        72,145,88,136
BM 2830 DATA 16,248,173,31,2
        08,201,6,208
FH 2840 DATA 249,173,31,208,
        201,7,208,249
HD 2850 DATA 76,79,72,35,47,
        48,57,50
BF 2860 DATA 41,39,40,52,0,1
        7,25,24
DO 2870 DATA 23,0,0,0,0,0,0,
        163
JB 2880 DATA 175,173,176,181
        ,180,165,129,0
CI 2890 DATA 176,181,220,72,
        8,73,162,142
DB 2900 DATA 140,0,169,174,1
        63,142,0,33
BL 2910 DATA 44,44,0,50,41,3
        9,40,52
BO 2920 DATA 51,0,50,37,51,3
        7,50,54
KI 2930 DATA 37,36,14,0,0,0,
        0,112
EC 2940 DATA 114,101,115,115
        ,0,115,116,97
AL 2950 DATA 114,116,155
```

Program 2: Commodore 64 Climber 5

Please refer to the "MLX" article in this issue before entering the following program.

```
0801:0B 08 0A 00 9E 32 30 36 2E
0809:31 00 00 00 4C FE 09 A2 C4
0811:18 A9 00 9D 00 D4 CA 10 6A
0819:FA A9 0F 8D 18 D4 A9 FF 33
0821:8D 0F D4 A9 80 8D 12 D4 24
0829:60 8D 11 C8 8A 48 98 48 6A
0831:AE 11 C8 BC 1A 11 A9 00 2A
0839:99 04 D4 BD 17 11 99 05 C2
0841:D4 BD 1D 11 99 06 D4 BD 2C
0849:20 11 D0 03 AD 1B D4 99 15
0851:01 D4 BD 23 11 99 04 D4 CC
0859:49 01 99 04 D4 68 A8 68 C3
0861:AA 60 A9 00 85 FC AD 19 A8
0869:C8 0A 0A 0A 85 FB 0A 26 98
0871:FC 0A 26 FC 18 65 FB 85 EA
0879:FB A5 FC 69 00 85 FC A5 DC
0881:FB 18 6D 18 C8 85 FB 85 9E
0889:FD 85 3B A9 04 65 FC 85 31
0891:FC 18 69 BC 85 3C 18 69 D5
0899:18 85 FE A0 00 60 49 FF 15
08A1:85 02 E6 02 A5 02 60 A2 8A
08A9:00 20 DE 08 AD 55 C8 C9 3C
08B1:27 90 29 AD 6E C8 8D 55 80
08B9:C8 AD 66 C8 8D 44 C8 AD AF
08C1:2C C8 20 9F 08 8D 2C C8 AF
08C9:AD F8 07 C9 A0 90 07 38 F9
08D1:E9 10 8D F8 07 60 18 69 6F
08D9:10 8D F8 07 60 BD 55 C8 52
08E1:9D 6E C8 BD 4C C8 9D 77 89
08E9:C8 BD 44 C8 9D 66 C8 BD B8
08F1:3C C8 9D 5E C8 BD 2C C8 4A
08F9:18 7D 44 C8 9D 44 C8 BD D7
0901:2C C8 30 0B BD 55 C8 69 50
0909:00 9D 55 C8 4C 18 09 BD 4C
0911:55 C8 E9 00 9D 55 C8 BD CE
0919:34 C8 18 7D 3C C8 9D 3C CE
0921:C8 BD 34 C8 30 0B BD 4C 8F
0929:C8 69 00 9D 4C C8 4C 3A 2C
0931:09 BD 4C C8 E9 00 9D 4C 24
0939:C8 60 8D 0E C8 8A 48 98 F3
0941:48 A2 05 AD B4 07 18 6D FA
0949:0E C8 8D B4 07 A9 00 8D FD
0951:0F C8 BD AF 07 C9 3A 90 34
0959:0D EE 0F C8 38 E9 0A C9 63
0961:3A B0 F6 9D AF 07 CA BD 62
0969:AF 07 18 6D 0F C8 9D AF 75
0971:07 E0 FF D0 D8 68 A8 68 6E
0979:AA 60 A2 07 A0 0E A9 00 4E
0981:8D 10 C8 BD 4C C8 10 0C 05
0989:BD 2E 11 2D 15 D0 8D 15 17
0991:D0 4C F8 09 BD 26 11 0D 84
0999:15 D0 8D 15 D0 BD 3C C8 2C
09A1:8D 0E C8 BD 4C C8 0E 0E A2
09A9:C8 2A 0E 0E C8 2A 0E 0E 66
09B1:C8 2A 69 1E 99 01 D0 BD F1
09B9:44 C8 8D 0E C8 BD 55 C8 63
09C1:0E 0E C8 2A 0E 0E C8 2A 7E
09C9:0E 0E C8 2A 8D 0F C8 2E 8A
09D1:10 C8 AD 0F C8 18 69 15 53
09D9:99 00 D0 AD 10 C8 69 00 24
09E1:F0 0C BD 26 11 0D 10 D0 37
09E9:8D 10 D0 4C F8 09 BD 2E 3B
09F1:11 2D 10 D0 8D 10 D0 88 BD
09F9:88 CA 10 82 60 A9 93 20 1E
0A01:D2 FF A9 40 A0 11 20 1E 5F
0A09:AB A9 FE 20 0A 11 A9 04 2B
0A11:8D 25 D0 A9 06 8D 26 D0 6D
0A19:A9 01 8D 27 D0 A9 04 8D 29
0A21:01 C8 A9 00 8D 02 C8 8D B0
0A29:21 D0 A9 00 8D 0C C8 8D F2
0A31:0D C8 A9 01 8D 0A C8 20 89
0A39:10 08 20 12 0E 20 BE 10 FA
0A41:20 BC 0A 20 08 0B 20 90 15
0A49:0C 20 7B 09 20 F8 10 AD 1E
0A51:04 C8 F0 EC 10 4D A2 0E 8F
0A59:A0 03 18 20 F0 FF A9 04 62
0A61:8D 01 C8 A9 8A A0 11 20 49
0A69:1E AB A9 FF 8D 16 C8 CE D1
0A71:0A C8 20 BC 0A AD 08 C8 6C
0A79:D0 29 CE 17 C8 D0 F3 CE CB
0A81:16 C8 D0 EE A2 0E A0 03 6D
0A89:18 20 F0 FF A9 AF A0 11 2E
0A91:20 1E AB 20 BC 0A AD 08 26
0A99:C8 F0 F8 A9 00 8D 0A C8 1B
0AA1:8D 0C C8 AE 0A C8 E8 E0 A9
0AA9:06 D0 07 A2 01 A9 01 8D 3E
0AB1:0C C8 8E 0A C8 20 BE 10 C4
0AB9:4C 41 0A A9 00 8D 2C C8 77
0AC1:8D 34 C8 8D 08 C8 AD 00 5A
0AC9:DC 8D 09 C8 4A B0 09 AE 33
0AD1:3D 11 8E 34 C8 4C FD 0A 5B
0AD9:4A B0 09 AE 3C 11 8E 34 C2
0AE1:C8 4C FD 0A 4A B0 09 AE A3
0AE9:3D 11 8E 2C C8 4C FD 0A F2
0AF1:4A B0 09 AE 3C 11 8E 2C D2
0AF9:C8 4C FD 0A AD 09 C8 29 32
0B01:10 D0 03 EE 08 C8 60 A9 70
0B09:00 8D 05 C8 20 6E 0D AD 32
0B11:1C C8 F0 16 C9 01 D0 03 DD
0B19:4C F5 0B C9 02 D0 03 4C 76
0B21:3E 0C C9 03 D0 03 4C 9E 8C
0B29:0B 60 AD 08 C8 8D 1C C8 90
0B31:F0 03 4C C4 0B AD 34 C8 96
0B39:F0 0D 20 AB 0D D0 03 4C C7
0B41:2F 0C A9 00 8D 34 C8 20 16
0B49:A8 08 20 E1 0D AD 2C C8 18
0B51:F0 12 30 08 A9 92 8D 1A B7
0B59:C8 4C 70 0B A9 A2 8D 1A B2
0B61:C8 4C 70 0B A9 81 8D F8 15
0B69:07 A9 00 8D 1B C8 60 EE F1
0B71:1B C8 AD 1B C8 C9 04 90 B4
0B79:05 A9 00 8D 1B C8 AD 1A C6
0B81:C8 18 6D 1B C8 8D F8 07 D6
0B89:A9 01 4C 2A 08 A9 85 8D 60
0B91:F8 07 A9 03 8D 1C C8 A9 63
0B99:0C 8D 07 C8 60 A9 85 8D C8
0BA1:F8 07 CE 07 C8 D0 0F A9 91
0BA9:00 8D 1C C8 A9 81 8D F8 9A
0BB1:07 A9 02 4C 2A 08 AD 07 8E
0BB9:C8 C9 03 B0 05 A9 81 8D 71
0BC1:F8 07 60 A9 01 20 2A 08 A1
0BC9:AD 2C C8 D0 03 4C 8E 0B 59
0BD1:A9 01 8D 1C C8 A9 00 8D EA
0BD9:1B C8 A9 A6 8D 0E C8 AD 33
0BE1:2C C8 30 05 A9 96 8D 0E 67
0BE9:C8 A9 09 8D 06 C8 AD 0E 85
0BF1:C8 8D 1A C8 A9 00 8D 34 3C
0BF9:C8 AD 3E 11 8D 2C C8 AD 15
0C01:F8 07 C9 A0 90 06 AD 3F D1
0C09:11 8D 2C C8 20 A8 08 AD 80
0C11:1B C8 CD 06 C8 D0 09 A9 48
0C19:00 8D 1C C8 8D 1B C8 60 6F
0C21:AD 1A C8 18 6D 1B C8 8D 28
0C29:F8 07 EE 1B C8 60 A9 02 2C
0C31:8D 1C C8 A9 82 8D F8 07 0E
0C39:A9 00 8D 1B C8 AD 34 C8 B7
0C41:D0 08 A9 83 8D F8 07 4C DB
0C49:6D 0C AD 0D C8 49 01 8D 9C
0C51:0D C8 F0 01 60 AD F8 07 03
0C59:C9 84 D0 08 A9 82 8D F8 7D
0C61:07 4C 6D 0C A9 02 20 2A 3E
0C69:08 EE F8 07 A9 00 8D 2C 65
0C71:C8 A2 00 20 DE 08 20 CC BC
0C79:0D F0 09 20 DE 08 20 CC 9B
0C81:0D F0 01 60 A9 00 8D 1C 07
0C89:C8 A9 81 8D F8 07 60 AD CB
0C91:05 C8 F0 01 60 20 6E 0D F9
0C99:A2 07 20 A2 0C CA D0 FA 1B
0CA1:60 BD 1C C8 D0 60 AD 1B E7
0CA9:D4 29 3F CD 0A C8 B0 6A 7A
0CB1:BD 66 0D 9D 4C C8 A9 00 96
0CB9:9D 3C C8 9D 34 C8 9D 44 E6
0CC1:C8 9D 55 C8 AD 1B D4 29 89
0CC9:1F 09 20 6D 3C 11 9D 2C 1C
0CD1:C8 9D 1C C8 A9 AF 9D F8 06
0CD9:07 AD 1B D4 29 3F CD 0B 7E
0CE1:C8 90 0D BD 2C C8 29 5F 36
0CE9:9D 2C C8 A9 B2 9D F8 07 94
0CF1:AD 1B D4 2D 0C C8 F0 0E 88
0CF9:BD 2C C8 20 9F 08 9D 2C 9B
0D01:C8 A9 27 9D 55 C8 20 DE 95
0D09:08 BD 55 C8 C9 28 90 0A E7
0D11:A9 00 9D 1C C8 A9 FF 9D FF
0D19:4C C8 BD F8 07 C9 B2 90 28
0D21:0C AD 1C D0 3D 2E 11 8D 8F
0D29:1C D0 4C 5D 0D AD 1C D0 0D
0D31:1D 26 11 8D 1C D0 DE 24 64
0D39:C8 F0 0E 30 12 BD 24 C8 51
0D41:9D 27 D0 A9 AF 9D F8 07 95
0D49:60 A9 B1 9D F8 07 60 A9 5C
0D51:06 38 ED 0A C8 0A 0A 0A 67
0D59:0A 9D 24 C8 BD F8 07 49 1A
0D61:01 9D F8 07 60 01 04 07 09
0D69:0A 0D 10 13 16 AD 1E D0 73
0D71:F0 31 A9 00 20 2A 08 A9 E8
0D79:0F 20 0A 11 CE 01 C8 30 B1
0D81:23 D0 0B A9 20 8D A1 07 DE
0D89:A9 FF 8D 04 C8 60 20 85 F7
0D91:10 20 7B 09 A9 01 8D 05 2D
0D99:C8 A9 3C 20 0A 11 AD 1E 1A
0DA1:D0 D0 FB 60 A9 00 8D 01 47
0DA9:C8 60 AD 44 C8 30 1B AC 24
0DB1:4C C8 8C 19 C8 AC 34 C8 71
0DB9:10 03 CE 19 C8 AD 55 C8 78
0DC1:8D 18 C8 20 63 08 B1 FB 5E
0DC9:C9 6B 60 AD 3C C8 C9 00 23
0DD1:D0 0D A2 08 AD 4C C8 DD 7A
0DD9:66 0D F0 03 CA 10 F8 60 A1
0DE1:AD 55 C8 8D 18 C8 AD 4C A5
0DE9:C8 8D 19 C8 20 63 08 B1 CB
0DF1:3B C9 DA D0 0D A9 01 8D 23
0DF9:04 C8 A9 5A 20 0A 11 EE 5D
0E01:20 D0 60 E6 FB D0 02 E6 E9
0E09:FC 60 E6 FD D0 02 E6 FE D3
0E11:60 A9 F8 85 FB A9 11 85 6D
0E19:FC A0 00 A9 40 85 FD A9 34
0E21:20 85 FE B1 FB F0 17 C9 45
0E29:FE F0 45 C9 FD F0 3A C9 38
0E31:FC F0 4A 91 FD 20 04 0E F0
0E39:20 0B 0E 4C 24 0E 8D 0E 31
0E41:C8 20 04 0E B1 FB 8D 0F D2
0E49:C8 AA AD 0E C8 91 FD C8 5C
0E51:CA D0 FA A0 00 A5 FD 18 1B
0E59:6D 0F C8 85 FD A5 FE 69 4F
0E61:00 85 FE 20 04 0E 4C 24 D5
0E69:0E A9 00 91 FD 20 0B 0E A4
0E71:A9 00 91 FD 20 0B 0E 20 DD
0E79:04 0E 4C 24 0E A2 07 A9 99
```

```
0E81:01 8D 1C D0 A9 AF 9D F8 52
0E89:07 CA D0 F8 A9 81 8D F8 EC
0E91:07 A9 91 8D 0E C8 A9 A0 2E
0E99:8D 0F C8 20 C3 0E EE 0E 9D
0EA1:C8 EE 0F C8 A9 A0 CD 0E C5
0EA9:C8 D0 F0 A9 B0 8D 0E C8 B7
0EB1:A9 B1 8D 0F C8 20 C3 0E 0E
0EB9:A9 B2 8D 0E C8 A9 B3 8D CB
0EC1:0F C8 A9 00 85 FB 85 FD F1
0EC9:AD 0E C8 4A 66 FB 4A 66 1C
0ED1:FB 85 FC AD 0F C8 4A 66 5E
0ED9:FD 4A 66 FD 85 FE A0 3C D9
0EE1:8C 10 C8 A0 3E 8C 11 C8 7A
0EE9:AC 10 C8 B1 FB 20 23 0F 4A
0EF1:AC 11 C8 91 FD AC 10 C8 66
0EF9:C8 B1 FB 20 23 0F 91 FD DE
0F01:AC 11 C8 B1 FB 20 23 0F A3
0F09:AC 10 C8 91 FD CE 11 C8 C9
0F11:CE 11 C8 CE 11 C8 CE 10 3A
0F19:C8 CE 10 C8 CE 10 C8 10 36
0F21:C7 60 8D 16 C8 A2 00 8E AD
0F29:18 C8 8E 17 C8 A9 00 0E C3
0F31:16 C8 2A 0E 16 C8 2A E0 BB
0F39:00 F0 06 0A 0A CA 4C 38 41
0F41:0F 0D 17 C8 8D 17 C8 EE E2
0F49:18 C8 AE 18 C8 E0 04 D0 9F
0F51:DC AD 17 C8 60 A9 31 20 E4
0F59:D5 10 AD 21 D0 48 AD 86 B7
0F61:02 8D 21 D0 A9 93 20 D2 C3
0F69:FF 68 8D 21 D0 A9 00 8D 20
0F71:18 C8 A2 04 8E 19 C8 20 EC
0F79:63 08 A9 78 91 FB 91 3B E2
0F81:A9 0F 91 FD C8 C0 28 D0 B4
0F89:F1 AE 19 C8 E8 E8 E8 E0 99
0F91:17 90 E1 AE 0A C8 BD 03 78
0F99:10 A8 8C 03 C8 B9 0A 10 FC
0FA1:8D 18 C8 AA B9 0B 10 8D F7
0FA9:19 C8 A8 18 20 F0 FF A9 8B
0FB1:7D A0 11 20 1E AB 20 63 1E
0FB9:08 A9 6B 91 3B A0 28 91 0B
0FC1:3B A0 50 91 3B AC 03 C8 24
0FC9:C8 C8 B9 0A 10 D0 CB A2 54
0FD1:03 A0 02 18 20 F0 FF A9 C9
0FD9:71 20 D2 FF A9 DA 8D A1 88
0FE1:C0 A2 17 A0 02 18 20 F0 97
0FE9:FF A9 D4 A0 11 20 1E AB 08
0FF1:A9 0E 38 ED 0A C8 0A 0A DF
0FF9:8D 0B C8 AD 0A C8 69 30 0C
1001:4C D2 FF 00 1F 3C 57 6C 01
1009:00 04 04 04 14 04 22 07 E6
1011:0A 07 1C 0A 04 0A 14 0A 96
1019:22 0D 0A 0D 1C 10 04 10 D8
1021:14 10 22 13 0A 13 1C 00 99
1029:04 04 04 22 07 0D 07 1C 85
1031:0A 07 0A 0F 0A 16 0D 0C 19
1039:0D 1A 10 0A 10 18 13 04 14
1041:13 13 13 22 00 04 14 07 73
1049:04 07 22 0A 04 0A 14 0A 8C
1051:22 0D 0E 0D 1D 10 05 10 9B
1059:14 13 03 13 14 13 23 00 0D
1061:04 14 07 04 07 22 0A 02 80
1069:0A 1C 0D 0F 0D 19 10 14 29
1071:13 03 13 24 00 04 25 07 E1
1079:01 0A 21 0D 05 10 1E 13 49
1081:02 13 25 00 A2 07 A9 00 90
1089:9D 1C C8 9D 44 C8 9D 3C 2F
1091:C8 A9 FF 9D 4C C8 CA 10 85
1099:ED AD 38 11 8D 55 C8 AD 35
10A1:39 11 8D 4C C8 A9 81 8D 96
10A9:F8 07 A2 00 A9 D3 9D A1 D5
10B1:07 E8 EC 01 C8 D0 F5 A9 5C
10B9:20 9D A1 07 60 20 56 0F 35
10C1:20 85 10 20 7B 09 A9 00 AA
10C9:8D 1C C8 8D 04 C8 AD 1E 66
10D1:D0 D0 FB 60 0A 0A 8D E9 91
10D9:10 A9 00 8D E8 10 8A 48 2A
10E1:98 48 A0 04 A2 00 9D 00 05
10E9:C8 E8 D0 FA EE E9 10 88 3A
10F1:D0 F2 68 A8 68 AA 60 A2 20
10F9:00 A0 19 E8 D0 FD 88 D0 54
1101:FA AD 8D 02 C9 01 F0 F9 0C
1109:60 65 A2 8D 16 C8 A5 A2 A3
1111:CD 16 C8 D0 F9 60 36 00 83
1119:00 00 07 07 00 63 F0 D4 D0
1121:01 01 80 81 81 01 02 04 44
1129:08 10 20 40 80 FE FD FB 53
1131:F7 EF DF BF 7F 16 27 13 F8
1139:16 14 EC 40 C0 50 B0 11 C6
1141:20 43 4F 50 59 52 49 47 21
1149:48 54 20 31 39 38 37 20 F4
1151:43 4F 4D 50 55 54 45 21 3F
1159:20 50 55 42 4C 49 43 41 BD
1161:54 49 4F 4E 53 0D 20 20 FD
1169:41 4C 4C 20 52 49 47 48 59
1171:54 53 20 52 45 53 45 52 10
1179:56 45 44 00 AB B3 11 9D 8C
1181:9D AB B3 11 9D 9D AB B3 53
1189:00 9E 12 20 46 49 52 45 D8
1191:20 54 4F 20 43 4F 4E 54 0D
1199:49 4E 55 45 20 41 54 20 C1
11A1:54 48 49 53 20 4C 45 56 71
11A9:45 4C 20 92 9A 00 9E 12 D2
11B1:20 20 46 49 52 45 20 54 85
11B9:4F 20 52 45 53 54 41 52 EA
11C1:54 20 41 54 20 4C 45 56 96
11C9:45 4C 20 4F 4E 45 20 20 82
11D1:92 9A 00 4C 49 56 45 53 2A
11D9:20 20 20 20 20 20 20 20 FB
11E1:4C 45 56 45 4C 20 20 00 BD
11E9:FD 50 FD A0 FE 02 A8 FE 39
11F1:02 A8 FE 02 A8 FE 01 00 82
11F9:0D A0 FD 50 FD 50 FD A0 5D
1201:FE 02 A8 FE 02 A8 FE 02 DC
1209:A8 FE 01 A4 FD F0 FD A0 FB
1211:FD A0 FD A0 FD A0 FD A0 35
1219:FD A0 FD F0 00 0F 04 FD 75
1221:08 FD A8 FD 58 FD 58 FE 28
1229:02 A8 FE 02 A0 FE 02 A0 1E
1231:FE 02 A0 FE 01 F0 FD A0 C1
1239:FD A0 FD A0 FD B0 FD 80 7D
1241:FD 80 FD C0 00 15 A0 FD E3
1249:50 FD 50 FE 02 A8 FE 02 C1
1251:A8 FE 01 A4 FD A0 FD F0 53
1259:FD A0 FD A0 FD A0 FD A0 7D
1261:FD A0 FD E0 FD 30 00 0E 39
1269:01 FD 02 FD 02 A0 FE 02 40
1271:50 FE 02 50 FE 02 A0 FD 02
1279:A8 FD A8 FD A8 FD F4 FD 8B
1281:A0 FD A0 FD A0 FD E0 FD 26
1289:20 FD 20 FD 30 00 18 A0 73
1291:FE 04 51 FE 08 52 FE 02 D9
1299:A8 FD A0 FD F0 FD A0 FD 44
12A1:A0 FE 02 08 FE 02 08 FD A4
12A9:CC 00 8D BD 00 3F 45 00 49
12B1:3F 55 00 3F 05 00 3F 44 A9
12B9:00 3F 4D 00 3F 55 00 3F E5
12C1:4F 00 3F 0C 00 3F 65 00 FD
12C9:4D A0 FD 50 FD 50 FD A0 4F
12D1:FE 02 A0 FE 02 A0 FE 02 8C
12D9:A0 FD 94 FD F0 FD A0 FD FE
12E1:A0 FD 88 FD 88 FE 02 08 13
12E9:FE 08 08 FE 0C 0C 00 12 23
12F1:A0 FD 50 FD 50 FD A0 FD 89
12F9:A0 FE 02 A0 FE 02 A0 FE B8
1301:02 A0 FD E4 FD A0 FD 20 EC
1309:FD 28 FD 28 FD A0 FE 03 ED
1311:A0 FD C0 00 15 A0 FD 50 96
1319:FD 50 FD A0 FE 02 A0 FE 5C
1321:02 A0 FE 02 A4 FD 70 FD 6C
1329:A0 FD A0 FD 88 FD 88 FE 5F
1331:02 20 FE 0C 20 FD 30 00 5A
1339:12 A0 FD 50 FD 50 FD A0 23
1341:FD A0 FE 02 A0 FE 02 A0 34
1349:FE 02 A0 FD E4 FD A0 FD C1
1351:20 FD 28 FD 28 FD A0 FE 65
1359:03 A0 FD C0 00 12 A0 FD 7C
1361:50 FD 50 FD A0 FE 02 A0 BE
1369:FE 02 A0 FE 02 A0 FD 64 86
1371:FD F0 FD A0 FD A0 FD 88 93
1379:FD 88 FE 02 08 FE 08 08 15
1381:FE 0C 0C 00 16 A0 FE 01 DD
1389:40 FE 05 FD 28 FD A8 40 DA
1391:FE AA FE 03 A0 FE 02 C0 B7
1399:FE 0A 80 FE 08 80 FE 20 22
13A1:80 FE C0 80 FE 02 FD 0C EF
13A9:00 25 02 80 EA EA 64 02 2F
13B1:EA 60 EA 02 00 03 A4 00 38
13B9:32 02 80 EA EA 64 EA EA E1
13C1:60 FE 02 00 03 A4 00 31 F3
13C9:30 FD 3A BA 60 02 BA 60 5B
13D1:FE 0A 90 00 2E 30 FD 38 72
13D9:FD 28 FD 0A FD 02 B0 FD C0
13E1:EA 60 FE 0A 60 FE 02 20 39
13E9:FD 84 FD 10 00 32 E0 FE 7A
13F1:0C 08 FE 02 28 FD AF FD B6
13F9:0E 60 FE 02 60 FE 02 84 C6
1401:FD 90 00 29 03 FD 28 FD 3D
1409:AC FD 3A FD 0A FD 1A FD A8
1411:94 FD A0 00 26 02 80 FE 50
1419:01 40 FE 01 44 FE 02 A2 86
1421:FE 02 8A FE 02 BA FE 02 85
1429:BA FD 73 C0 00 1C 02 80 9D
1431:FE 01 40 FE 01 40 FE 0A 22
1439:FD 0A FD 0B FD 0A FD 09 70
1441:80 FE 02 A0 FD A0 FE 02 26
1449:80 FE 02 FD 0C 00 85 24 21
1451:00 3F 25 00 3F 65 00 3F BC
1459:04 00 3F 04 00 3F 44 00 31
1461:3F 0C 00 3F 04 00 3F 04 C2
1469:00 3F 44 00 3F 54 00 3F 74
1471:24 00 3F A6 00 3F E6 FE C7
1479:28 FD AA FE 02 AA 80 0A 40
1481:AA A0 00 27 0A AA A0 02 D7
1489:AA 80 FE AA FD 28 FE FF 40
1491:FE 28 FD AA FE 02 AA 80 83
1499:0A AA A0 FE 10 40 FE 05 F9
14A1:FD 01 00 03 40 FE 01 FD 37
14A9:04 FD 10 FD 04 FD 01 FD 4D
14B1:04 FD 10 FD 44 FE 01 01 5E
14B9:FE 0A AA A0 02 AA 80 FE FD
14C1:AA FD 28 FE FF 00 3F FF 32
14C9:FE EB FE 03 A0 FD EC FD 51
14D1:2B FD EC FE 03 A0 FD EC 20
14D9:FD 2B FD EC FE 03 A0 FD 9D
14E1:EC FD 2B FD EC FE 03 A0 4F
14E9:FD EC FD 2B FD EC FE 03 63
14F1:A0 FD EC FD 2B FE 03 AC 6F
14F9:FD 02 FC 00 00 00 00 00 41
```

Program 3: Amiga Climber 5

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
'Climber 5
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DEFINT a-z
men=5:SAY TRANSLATE$("climer five!")
DIM map(45,24),mdat(100),chk&(7),ex(4),ey(4),ty(4),old(2),mindex(4):endmap=100
GOSUB DefinePLayFieLd
RESTORE mapdata:t=1:cm=1
WHILE t<>-1
READ t:mdat(c)=t :c=c+1
IF t=0 THEN mindex(cm)=c:cm=cm+1
WEND

mapdata:
DATA 1,6, 1,12, 1,18, 2,2, 2,9, 2,15, 3,6, 3,12, 3,18, 4,2, 4,9, 4,15, 0
DATA 1,3, 1,16, 2,5, 2,15, 3,9, 3,11, 4,7, 4,14, 0
DATA 1,9, 2,3, 2,13, 3,7, 3,17, 4,14, 0
DATA 1,7, 2,17, 3,3, 3,10, 4,15, 0
DATA 1,10, 2,4, 3,13, 4,9, -1

stand=0:cl= 867:rtl=313:rt2=420:duck=103:baLL=654:gird=603:hook=685
c2=974:Ltl=1081:Lt2=1188:shorthook=1371
GOSUB makeshapes:
NewBoard:
GOSUB MakeMap:px=266:py=138:psn=313
PUT (px,py),shape(psn):cf=0
FOR i=0 TO 4:ex(i)=320:NEXT
main:
```

```
WHILE vnext=0
'keyboard input
kf=33:dx=0:dy=0:a=0
WHILE dx=0 AND dy=0 AND kf>0
a$=INKEY$:a=ASC(a$+" ")
IF a=29 THEN dy=8:GOTO keypresse
d
IF a=28 THEN dy=-8:GOTO keypress
ed
IF a=31 THEN dx=-8:GOTO keypress
ed
IF a=30 THEN dx=8
kf=kf-1
keypressed:
WEND
GOSUB pLayer
'hooks
FOR n = 0 TO 4
IF ex(n)<318 THEN onscreen
PUT(ex(n),ey(n)),shape(hook),XOR
t!=RND(1):IF t!>.3 THEN eskip
IF  t!>.2 THEN esn(n)=hook ELSE
esn(n)=shorthook
ex(n)=0:ty(n)=n*4+1:ey(n)=n*32+9
PUT (ex(n),ey(n)),shape(esn(n)),
XOR
onscreen:
th=esn(n)
PUT (ex(n),ey(n)),shape(th),XOR
ex(n) = ex(n)+16
PUT (ex(n),ey(n)),shape(th),XOR
tx=ex(n)/8:ty=ty(n)
IF th=hook AND ( map(tx-1,ty+1)=
2 OR map(tx,ty+1)=2 OR map(tx-2,
ty+1)=2 ) THEN GOSUB kiLLed
IF map(tx-1,ty)=2 OR map(tx,ty)=
2 OR map(tx-2,ty)=2 THEN GOSUB k
iLLed
eskip:
NEXT
WEND
t$="I got the ball":IF building>
0 THEN t$=t$+" again."
IF building=4 THEN t$="I am gett
ing tired."
IF vnext=2 THEN SAY TRANSLATE$(t
$)
vnext=0
IF men>0 THEN NextMap
SAY TRANSLATE$("game over.")
LOCATE 1,1:PRINT " (C)ontinue ":
PRINT " (R)estart    ":PRINT " (
Q)uit "
men=5
Loopg: a$=INKEY$:IF a$="r" THEN
building=0:GOTO NewBoard
IF a$="c" THEN GOTO NewBoard
IF a$="q" THEN CLS:CLEAR:STOP
GOTO Loopg
NextMap:
building=(building+1) MOD 5
GOTO NewBoard
kiLLed:
SAY TRANSLATE$("ouch.")
PUT (px,py),shape(psn),XOR
FOR i=0 TO 2:map (mx,my+i-2)=old
(i):old(i)=0:NEXT
PUT (ex(4),ey(4)),shape(esn(4)),
XOR
px=266:py=138
ex(4)=318:psn=stand:cf=0
PUT (px,py),shape(psn):men=men-1
IF men=<0 THEN vnext=1:men=0
LOCATE 23,8:PRINT " Climbers ";m
en;" Level ";building+1;
RETURN

pLayer:
WHILE INKEY$<>"":WEND
mx=px/8:my=(py+17)/8
map (mx,my-2)=old(0)
map (mx,my-1)=old(1)
map (mx,my)=old(2)
IF dy AND cf=0 THEN GOSUB trycLi
mb
ON cf GOTO cLimbing,ducking
IF dx THEN movepLay
sf=sf+1:REM standing on girder
IF sf>2 THEN PUT (px,py),shape(p
sn),XOR:PUT (px,py),shape(stand)
:sf=1:psn=stand
GOTO oLdmap

trycLimb:
t=my:IF dy>0 THEN t=my+1
IF map(mx,t)=1 THEN cf=1:RETURN
IF dy>0 THEN PUT (px,py),shape(p
sn),XOR:PUT (px,py),shape(duck):
psn=duck:cf=2
RETURN

movepLay:
sf=0 :pb=rt1:IF dx<0 THEN pb=Lt1

tx=px+dx :ty=py
IF tx<8 OR tx>300 THEN tx=px
IF tx=10 AND ty=10 THEN fr=1:pb=
duck:vnext=2
GOTO animate

ducking:
IF dx OR dy<0 THEN cf=0:psn=duck
:RETURN
GOSUB oLdmap
map(mx,my-2)=0
RETURN

cLimbing:
IF dy=0 THEN oLdmap
pb=cl:tx=px:ty=py+dy:tmy=(ty+17)
/8
IF (tmy AND 3)=3 THEN cf=0:pb=st
and:fr=1
GOTO animate

animate:
PUT (px,py),shape(psn),XOR
fr=1-fr:psn=pb+fr*107
PUT (tx,ty),shape(psn)
px=tx:py=ty:mx=px/8:my=(py+17)/8

oLdmap:
old(0)=map(mx,my-2):map(mx,my-2)
=2
old(1)=map(mx,my-1):map(mx,my-1)
=2
old(2)=map(mx,my):map(mx,my)=2
RETURN

MakeMap:
FOR i= 0 TO 39:FOR j=0 TO 24
map(i,j)=0:NEXT:NEXT
c = mindex(building):CLS :yc=0
FOR y=yc TO yc+180 STEP 32:FOR x
=0 TO 319 STEP 8
PUT (x,y),shape(gird):NEXT:NEXT
WHILE mdat(c)>0
y2=mdat(c):x2=mdat(c+1)*2:my=y2*
4
FOR j=my TO my+3:map(x2,j)=1:NEX
T
tx=x2*8:ty=y2*32-5
LINE (tx,ty)-(tx+16,ty+36),0,bf
LINE (tx,ty)-(tx+2,ty+36),8,bf
LINE (tx+14,ty)-(tx+16,ty+36),8,
bf
FOR j=ty+4 TO ty+28 STEP 8
LINE (tx+2,j)-(tx+14,j),8,b:NEXT
j
temp:
c=c+2
WEND
PUT (20,28),shape(baLL):map(0,0)
=-1
LOCATE 23,8:PRINT " Climbers ";m
en;" Level ";building+1;

RETURN
makeshapes:
i2=0 :RESTORE makeshapes:CLS
LOCATE 10,2:PRINT "Copyright 198
7 Compute! Publications"
LOCATE 12,10:PRINT "All rights r
eserved."
FOR i=0 TO 7:READ chk&(i):NEXT
' checksums
DATA 445496, 818859, 1393851
DATA 1902864, 2002109, 2100910
DATA 2406221, 2606260
DIM shape(1599)
'shape 0  man standing still
m= 102 :m2= 58:GOSUB ReadCompres
sed
DATA 14 , 22 , 4 , 40002 , 256 ,
896 , 1408 , 3968
DATA 1792 , 8160 , 16368 , 30664
,-4124 , 32756 , 15736 , 8176
DATA 3040 , 2400 , 736 , 2240 ,
2784 , 3808 , 7920 , 15480
DATA 40002 , 768 , 3968 , 1280 ,
3840 , 768 , 3840 , 8160
DATA 16368 , 30680 , 14296 , 683
2 , 2080 , 1024 , 1664 , 3072
DATA 1568 , 1024 , 40007 , 1280
, 3840 , 768 , 1536 , 0
DATA 2080 , 4112 , 0 , 2720 , 40
64 , 1728 , 1728 , 3136
DATA 1632 , 1088 , 40037
'shape 1  cLimbing
m= 102 :m2= 43:GOSUB ReadCompres
sed
DATA 14 , 22 , 4 , 40007 , 128 ,
448 , 640 , 1920
DATA 896 , 8176 , 16376 , 16376
, 16376 , 16376 , 8176 , 8176
DATA 7280 , 7280 , 31868 , 40007
, 384 , 1984 , 640 , 1920
DATA 128 , 896 , 8176 , 5008 , 4
368 , 12312 , 4112 , 40013
DATA 640 , 1920 , 128 , 896 , 25
6 , 0 , 3104 , 15288
DATA 6448 , 2080 , 2080 , 40036

'shape 2  ducking
m= 106 :m2= 56:GOSUB ReadCompres
sed
DATA 14 , 23 , 4 , 40003 , 8192
, 29440 , 30592 , 22400
DATA 29440 , 27872 , 24720 , 136
40 , 6728 , 3832 , 3432 , 7664
DATA 7024 , 5808 , 4848 , 6896 ,
7920 , 7920 , 7776 , 3072
DATA 40004 , 8960 , 1920 , 8192
, 8960 , 13056 , 16352 , 8176
DATA 2032 , 2032 , 656 , 528 , 1
152 , 2112 , 3072 , 1024
DATA 40008 , 8192 , 40002 , 768
, 4864 , 0 , 2048 , 1056
DATA 0 , 640 , 4080 , 3296 , 316
8 , 3104 , 3168 , 3072
DATA 40038
'shape 3 run right
m= 106 :m2= 63:GOSUB ReadCompres
sed
DATA 13 , 23 , 4 , 0 , 512 , 332
8 , 8064 , 7424
DATA 8064 , 3856 , 5688 , 14200
, 25584 ,-8288 , 32704 , 16128
DATA 7936 , 8064 , 6080 , 9184 ,
19952 , 23008 ,-27712 ,-2176
DATA 29568 , 14816 , 0 , 1536 ,
3840 , 8128 , 1280 , 1920
DATA 3584 , 1552 , 7728 , 16224
, 28480 , 14080 , 6656 , 3072
DATA 0 , 2048 , 7168 , 12288 , 8
192 , 24576 , 40007 , 1280
DATA 1920 , 3584 , 1552 , 16 , 0
, 64 , 0 , 2048
DATA 3072 , 768 , 2944 , 7616 ,
12384 , 8384 , 24960 , 40038
'shape 4  running right second f
rame
m= 182 :m2= 95:GOSUB ReadCompres
sed
DATA 25 , 20 , 4 , 40002 , 32 ,
```

```
0 , 112 , 0 ←
DATA 254 , 0 , 232 , 0 , 252 , 0
, 120 , 0 ←
DATA 240 , 0 , 944 , 0 , 1919 ,-
32768 , 3519 ,-16384 ←
DATA 4031 ,-32768 , 2040 , 0 , 1
023 , 0 , 383 ,-16384 ←
DATA 15871 ,-16384 , 32739 ,-819
2 ,-64 ,-512 ,-6208 , 32256 ←
DATA 384 , 28672 , 40002 , 48 ,
0 , 120 , 0 , 254 ←
DATA 0 , 40 , 0 , 60 , 0 , 112 ,
0 , 112 ←
DATA 0 , 224 , 0 , 688 , 0 , 175
9 ,-32768 , 608 ←
DATA 0 , 768 , 40003 , 128 , 400
19 , 40 , 0 , 60 ←
DATA 0 , 112 , 0 , 48 , 40004 ,-
32768 , 513 ,-16384 ←
DATA 0 ,-32768 , 768 , 0 , 752 ,
0 , 239 , 0 ←
DATA 227 ,-32768 , 1216 ,-16384
, 1920 , 16384 , 384 , 40063 ←
'shape 5  girder←
m= 50 :m2= 25:GOSUB ReadCompress
ed←
DATA 8 , 9 , 4 , 0 , 1024 ,-1024
, 30720 , 13056 ←
DATA -30976 ,-12544 , 4096 , 400
02 , 8192 , 40005 ,-32256 , 0 ←
DATA -256 ,-256 , 768 ,-30976 ,-
13312 , 30720 , 12288 ,-256 ←
DATA -256 , 40021←
'shape 6  ball←
m= 30 :m2= 14:GOSUB ReadCompress
ed←
DATA 5 , 4 , 4 , 30720 , 18432 ,
22528 , 30720 , 12288 ←
DATA 30720 , 30720 , 12288 , 184
32 , 40002 , 18432 , 40016  ←
'shape 7  hook←
m= 182 :m2= 53:GOSUB ReadCompres
sed←
DATA 15 , 20 , 4 , 4088 , 2032 ,
992 , 448 , 448 ←
DATA 448 , 448 , 448 , 448 , 992
, 480 , 448 , 4032 ←
DATA 16352 , 30720 ,-4096 ,-4096
, 28672 , 14340 , 4088 , 4096 ←
DATA 2496 , 1152 , 512 , 40006 ,
512 , 0 , 4128 , 16384 ←
DATA -32768 , 2048 , 0 ,-30720 ,
17416 , 4100 , 4096 , 2048 ←
DATA 1024 , 512 , 40006 , 512 ,
0 , 4128 , 16384 ,-32768 ←
DATA 2048 , 0 ,-30720 , 17416 ,
4100 , 40120 ←
PUT (0,0),shape(206):PUT (30,0),
shape(rt1)←
PUT (60,0),shape(rt2):PUT (90,0)
,shape(hook)←
GET (90,12)-(105,20),shape(short
hook)←
GET (0,0)-(14,23),shape(c1)←
x2=0:y2=0:y3=40:psn=c2:nx=14:ny=
23:GOSUB ReverseBob←
x2=30:psn=Lt1:nx=13:ny=23:GOSUB
ReverseBob←
x2=60:psn=Lt2:nx=25:ny=20:GOSUB
ReverseBob←
RETURN←
ReverseBob:←
FOR i= 0 TO nx-1←
FOR j=0 TO ny-1←
t=POINT (i+x2,j+y2)←
PRESET (x2+nx-i,j+y3),t←
NEXT j←
NEXT i←
GET (x2,y3)-(x2+nx,y3+ny),shape(
psn)←
RETURN←
ReadCompressed: ←
FOR j=0 TO m2 ←
READ t&:s&=s&+t&←
IF t&<40000& THEN shape(i2)=t&:i
2=i2+1 ELSE FOR i=0 TO t&-40000&
:shape(i+i2)=0:NEXT:i2=i2+t&-400
00&←
NEXT←
IF chk&(ns)<>s& THEN PRINT "erro
r in checksum";ns:PRINT " or in
shape";ns;"data statements":STOP
←
ns=ns+1←
RETURN←
←
DefinePLayFieLd:←
SCREEN 1,320,200,4,1←
WINDOW 1,"Climber 5",,2,1←
RESTORE DefinePLayFieLd←
FOR i=0 TO 7←
READ a1,b1,c1←
PALETTE i,a1,b1,c1←
PALETTE i+8,a1,b1,c1←
NEXT :PALETTE 8,.25,.25,.25←
DATA .45, .45, .6, .1, .1, .1, .
85, .85, .8, .8, .7, .7←
DATA .85, .1, .1, .6, .45, .4, .
45, .4, .3, 1, .6, .5←
RETURN ←
```

Program 4: IBM PC/PCjr Climber 5

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
DA 10 'COPYRIGHT 1987
NM 20 'COMPUTE! PUBLICATIONS,INC
   .
AB 30 'ALL RIGHTS RESERVED.
BP 40 KEY OFF:DEF SEG=0:DEFINT A
      -Z:POKE 1047,PEEK(1047) OR
       64:RANDOMIZE TIMER
HG 50 SCREEN 1,0:COLOR 1,1:WIDTH
       40
HA 60 CLS
EF 70 PRINT TAB(14)"Copyright 19
      87"
GG 80 PRINT TAB(8)"Compute! Publ
      ications, Inc."
AC 90 PRINT TAB(12)"All Rights R
      eserved."
NK 100 FOR X=1 TO 2400:NEXT
GB 110 DIM LADR(37),RT1(15),LT1(
       15),RT2(15),LT2(15),CL1(1
       5),CL2(15),WPC(16),WPS(11
       ),BL(7)
OA 120 GOSUB 180:PL=5:LV=1
FK 130 POKE 1050,PEEK(1052):GOSU
       B 350
KG 140 GOSUB 380
KB 150 IF CD THEN SOUND 37,5:GOS
       UB 730:GOTO 690
CM 160 GOSUB 470:IF XC<>BLX(LV)
       OR LL<>6 THEN 140
MD 170 GOSUB 730:PUT(BLX(LV)+3,4
       7),BL:LV=LV+1:IF LV=5 THE
       N 710 ELSE PUT(BLX(LV)+3,
       47),BL:LOCATE 24,23:PRINT
        LV;:GOTO 130
BD 180 RESTORE 760:CLS
JK 190 READ LT1(0),LT1(1):FOR I=
       2 TO 15:READ A$:LT1(I)=VA
       L("&H"+A$):NEXT
NI 200 READ LT2(0),LT2(1):FOR I=
       2 TO 15:READ A$:LT2(I)=VA
       L("&H"+A$):NEXT
DB 210 READ RT1(0),RT1(1):FOR I=
       2 TO 15:READ A$:RT1(I)=VA
       L("&H"+A$):NEXT
IC 220 READ RT2(0),RT2(1):FOR I=
       2 TO 15:READ A$:RT2(I)=VA
       L("&H"+A$):NEXT
JO 230 READ CL1(0),CL1(1):FOR I=
       2 TO 15:READ A$:CL1(I)=VA
       L("&H"+A$):NEXT
OP 240 READ CL2(0),CL2(1):FOR I=
       2 TO 15:READ A$:CL2(I)=VA
       L("&H"+A$):NEXT
LA 250 READ LADR(0),LADR(1):FOR
       I=2 TO 37:READ A$:LADR(I)
       =VAL("&H"+A$):NEXT
MA 260 LOCATE 3,17:PRINT"CLIMBER
        5":LOCATE 24,18:PRINT"LE
       VEL 1";
DA 270 LINE(0,0)-(0,7),1:LINE(8,
       0)-(8,7),1:GET(0,0)-(0,7)
       ,WPS:GET(0,0)-(8,7),WPC:P
       UT(0,0),WPC
BJ 280 RESTORE 280:FOR I=1 TO 4:
       READ BLX(I):NEXT:DATA 252
       ,188,124,60
DC 290 FOR I=0 TO 6:LINE(58,50+2
       0*I)-(268,50+20*I),2:NEXT
BH 300 CIRCLE(256,48),1:PAINT(25
       6,48):GET(255,47)-(257,49
       ),BL
NO 310 FOR I=0 TO 5:Y=47+20*I
BP 320 IF (I AND 1)=1 THEN FOR J
       =0 TO 3:PUT(63+J*64,Y),LA
       DR,OR:NEXT
LP 330 IF (I AND 1)=0 THEN FOR J
       =0 TO 2:PUT(95+J*64,Y),LA
       DR,OR:NEXT
GL 340 NEXT:RETURN
OH 350 PUT(256,157),LT1:XP=256:Y
       P=157:XC=256:YC=157:DIR=1
       :DIRP=1:DHP=1:FR=0:STAND=
       1
ON 360 FOR I=0 TO 6:WPO(I)=0:WPX
       (I)=0:WPY(I)=38+I*20:NEXT
ML 370 RETURN
BD 380 DX=0:DY=0
JA 390 K$=RIGHT$(INKEY$,1):A$=RI
       GHT$(INKEY$,1):IF A$<>""
       THEN K$=A$
GO 400 POKE 1050,PEEK(1052):GOTO
        630
NE 410 IF K$=CHR$(72) THEN IF ((
       XC+32*(INT((YC-21)/20) AN
       D 1)) MOD 64)=0 AND YC>37
        THEN DIR=0:DY=-4:GOTO 46
       0
CD 420 IF K$=CHR$(80) THEN IF ((
       XC+32*(INT((YC-17)/20) AN
       D 1)) MOD 64)=0 AND YC<15
       7 THEN DIR=0:DY=4:GOTO 46
       0
KC 430 IF K$=CHR$(75) THEN IF (Y
       C-37) MOD 20=0 AND XC>60
       THEN DIR=1:DHP=1:DX=-4:GO
       TO 460
KK 440 IF K$=CHR$(77) THEN IF (Y
       C-37) MOD 20=0 AND XC<260
        THEN DIR=2:DHP=2:DX=4:GO
       TO 460
HP 450 IF DX=0 AND DY=0 THEN IF
       STAND THEN 390 ELSE DIR=D
       HP
FK 460 XC=XC+DX:YC=YC+DY:RETURN
DA 470 STAND=1:ON DIRP GOTO 500,
       520
BP 480 IF FR AND 1 THEN PUT(XP,Y
       P),CL2 ELSE PUT(XP,YP),CL
       1
GF 490 GOTO 540
AB 500 IF FR AND 1 THEN PUT(XP,Y
       P-1),LT2 ELSE PUT(XP,YP),
       LT1
FG 510 GOTO 540
CB 520 IF FR AND 1 THEN PUT(XP,Y
       P-1),RT2 ELSE PUT(XP,YP),
       RT1
GK 530 GOTO 540
MA 540 FR=1-FR:ON DIR GOTO 580,6
       00
EI 550 IF FR AND 1 THEN PUT(XC,Y
       C),CL2 ELSE PUT(XC,YC),CL
       1
ML 560 STAND=NOT((YC-37) MOD 20=
       0)
FG 570 GOTO 620
JB 580 IF FR AND 1 THEN PUT(XC,Y
       C-1),LT2:STAND=0 ELSE PUT
       (XC,YC),LT1
```

```
BK 590 GOTO 620
NO 600 IF FR AND 1 THEN PUT(XC,Y
       C-1),RT2:STAND=0 ELSE PUT
       (XC,YC),RT1
FL 610 GOTO 620
IF 620 DIRP=DIR:XP=XC:YP=YC:RETU
       RN
HD 630 LL=INT((YC-37)/20)+6:LH=L
       L+2
BI 640 FOR J=LL TO LH:I=J MOD 7:
       IF ABS(XC-WPX(I)-56)<5 TH
       EN IF ABS(YC-WPY(I)+2)<10
        THEN CD=1
NE 650 IF WPO(I) THEN WPX(I)=(WP
       X(I)+8) MOD 224:WPY=38+I*
       20:PUT(WPX(I)+48,WPY(I)),
       WPC:WPO(I)=WPX(I) ELSE IF
        RND>.8 THEN PUT(WPX(I)+4
       8,WPY(I)),WPC:WPO(I)=1
OO 660 NEXT
MM 670 IF CD THEN RETURN
EK 680 GOTO 410
FI 690 PL=PL-1:LOCATE 3,24:PRINT
        PL
QK 700 IF PL>0 THEN 130
JN 710 LOCATE 5,12:PRINT"Another
        game (Y/N)?"
GF 720 K$=INKEY$:IF K$="Y" THEN
       120 ELSE IF K$="N" THEN C
       LS:END ELSE 720
JE 730 FR=1-FR:GOSUB 540:FOR I=0
        TO 6:PUT(WPX(I)+56,WPY(I
       )),WPS:NEXT:CD=0
NJ 740 RETURN
BD 750 REM LT1
OJ 760 DATA 12,13,8002,802A,C00F
       ,2,800A,C03A
CC 770 DATA C00F,800A,4005,4004,
       5014,1010,F0F0,0
CE 780 REM LT2
BJ 790 DATA 12,12,A,AA,3F,8,2A,C
       0EB
DD 800 DATA C02A,C02B,15,51,7071
       ,3030,0,0
EC 810 REM RT1
BE 820 DATA 12,13,28,802A,3F,8,2
       A,C03A
QJ 830 DATA 3F,2A,15,11,4051,404
       0,F0F0,0
FD 840 REM RT2
FN 850 DATA 12,12,A,A00A,C00F,2,
       800A,B03E
ND 860 DATA 803A,803E,4005,5004,
       D0D4,C0C0,3C00,0
MH 870 REM CL1
OH 880 DATA 14,13,A,CF,82,A0AA,A
       828,8808
BB 890 DATA 8C0A,4005,4005,4004,
       400C,4000,C000,0
HF 900 REM CL2
BM 910 DATA 14,13,8002,CC03,802,
       A82A,A0A8,8088
BK 920 DATA 80CA,4005,4005,4004,
       C004,4,C,0
FB 930 REM LADDER
CF 940 DATA 18,23,C0,C0C0,C000,C
       0,C0C0,C000
KD 950 DATA C0,FFC0,C0FF,C0,C0C0
       ,C000,C0,FFC0
NN 960 DATA C0FF,C0,C0C0,C000,C0
       ,FFC0,C0FF,C0
LP 970 DATA C0C0,C000,C0,FFC0,C0
       FF,C0,C0C0,C000
FC 980 DATA C0,C0C0,C000,C0,C0,0
```

Program 5: Apple II Climber 5

Please refer to the "MLX" article in this issue before entering the following program.

```
0C00: A9 91 20 ED FD AD 83 1A FB
0C08: F0 1B A9 00 85 EC A9 60 28
0C10: 85 ED 20 83 1A A9 63 85 66
0C18: FA A9 11 85 FB 20 37 16 77
0C20: A9 00 8D 83 1A 20 23 1B A6
0C28: 20 3B 18 A9 05 8D 86 1A 42
0C30: A9 00 8D 85 1A A9 20 85 64
0C38: E6 20 F2 F3 A9 40 85 E6 A9
0C40: 20 F2 F3 A9 00 8D 87 1A 9D
0C48: 8D 88 1A 8D 84 1A 20 51 83
0C50: 18 AD 57 C0 AD 54 C0 AD C4
0C58: 53 C0 AD 50 C0 20 B1 1B 07
0C60: A5 E6 85 1D 49 60 85 FF 5E
0C68: A0 00 84 1C 84 FE B1 1C C2
0C70: 91 FE 88 D0 F9 E6 1D E6 BB
0C78: FF A5 FF 29 1F D0 EF A9 52
0C80: 4B 85 EE A9 10 85 EF A9 38
0C88: 00 8D 97 1A 8D 98 1A 8D 29
0C90: 99 1A A9 70 8D 95 1A 20 4F
0C98: DE 15 A9 88 8D 96 1A 8D AB
0CA0: 4F 10 A2 04 8E B9 1A 20 A8
0CA8: D3 0F AE B9 1A A9 FF 9D F4
0CB0: AA 1A A9 00 9D A5 1A CA 5C
0CB8: 10 EA 20 19 18 8D BA 1A AF
0CC0: 20 E5 13 AD 96 1A C9 08 58
0CC8: D0 07 AD 95 1A C9 06 90 AE
0CD0: 54 A2 04 AD 96 1A DD 1B 0B
0CD8: 0D 90 2F DD 20 0D B0 2A 20
0CE0: BD A5 1A F0 25 AD 95 1A B8
0CE8: 69 04 DD 9B 1A B0 1B 69 5F
0CF0: 03 DD 9B 1A 90 14 BD AA 12
0CF8: 1A 10 3F AD 98 1A C9 01 A6
0D00: F0 08 C9 06 F0 04 C9 0B 64
0D08: D0 30 CA 10 C6 20 7E 0D B1
0D10: 20 0B 0F AD 84 1A D0 4F 37
0D18: 4C C0 0C 00 11 31 51 71 6B
0D20: 1C 3C 5C 7C 9C EE 85 1A 70
0D28: AD 85 1A C9 05 D0 05 A9 79
0D30: 00 8D 85 1A 20 3B 18 4C 6A
0D38: 35 0C CE 86 1A F0 06 20 F2
0D40: 3B 18 4C 35 0C A9 5D A0 3D
0D48: 1A 20 93 18 20 73 18 2C 96
0D50: 10 C0 AD 00 C0 10 FB 2C C2
0D58: 10 C0 29 DF C9 CE F0 07 40
0D60: C9 D9 D0 EE 4C 2B 0C 2C 32
0D68: 54 C0 2C 51 C0 A9 00 8D B1
0D70: 00 08 8D 01 08 8D 02 08 D0
0D78: 20 58 FC 4C D0 03 A9 4B 4E
0D80: 85 EE A9 10 85 EF AD 00 96
0D88: C0 30 03 4C 12 0E 2C 10 65
0D90: C0 C9 8D D0 0A AD 00 C0 04
0D98: 10 FB 8D 10 C0 30 73 C9 E3
0DA0: 83 D0 03 8D 84 1A 29 DF A8
0DA8: AE 97 1A E0 05 B0 63 E0 E3
0DB0: 03 90 1C F0 06 C9 C9 F0 DE
0DB8: 06 D0 57 C9 CD D0 53 38 22
0DC0: A9 08 ED 9A 1A 8D 9A 1A 6F
0DC8: A9 07 4D 97 1A D0 5E CA 38
0DD0: 10 06 A2 07 C9 B0 F0 56 C1
0DD8: A2 06 C9 D5 F0 50 CA C9 84
0DE0: CF F0 4B A2 02 C9 CA F0 70
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1CB0: A9 9C 4E 25 44 A2 54 CA 21
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Bank Street Writer Plus

Ervin Bobo

Requirements: Apple IIe, IIc, or IIGS computer with minimum 128K memory; IBM PC and compatibles.

There will probably never be a perfect word processor, one capable of being all things to all people, of fulfilling every writing need that may ever arise, but *Bank Street Writer Plus* brings us a little closer to the unattainable.

If you've been using computers for a few years, you'll probably remember that the original *Bank Street Writer* was introduced as a means of simplifying and/or overcoming the arcane commands with which we then addressed word processors—commands sufficiently encrypted that the hard copy returned for our labors was sometimes not worth the perf paper on which it was printed.

Along came *Bank Street Writer*, one of the first programs to make word processing as simple and instinctive as using a typewriter, and now comes *Bank Street Writer Plus*. While the goals of simplicity are the same, the implementation is better than before.

Besides giving you an 80-column by 19-line text display, with a few lines of prompts at the top of the screen, *Bank Street Writer Plus* also features drop-down menus that can be accessed by pressing the escape key; this may be done at any time, at any point within your manuscript. Pressing the key brings up a command line of topics such as File, Edit, Spell, Options, Disk. Move your cursor to any category, press Return, and the menu opens to show you your options. Cursor down to your choice, press Return, and the command line will provide instructions.

Many Ways To Simplify

In File, you find the options of saving, retrieving, and deleting files. In Edit, you find such things as block copy, move, erase, and find/replace as well as *undo* commands for these options. In Options, you can set tab stops, change disk locations, and define function keys. In this last option, each function key can be defined as a macro of up to 32 characters. Since the macros thus created are invoked by a combination of either "Apple" key and the proper function key, it follows that you can have as many as 20 preset words or phrases ready to appear in your text with only a double keystroke.

Alternately, the function keys can be defined as a series of answers to the many prompts that appear with most filing and printing options: Rather than respond to a series of questions, the entire series can be answered in advance. All function key definitions can be saved to the master disk for future use. (Since there are no function keys on the IIe or IIc computers, this feature was obviously intended for the IIGS. It also works on the Laser 128.)

Bank Street Writer Plus follows a line of logical operations, mentioned here only because not all word processors use such logic. Printer setup and formatting are done before the program boots. Disk formatting may be done at any time, for those of us who enter half a manuscript before remembering we have no disk to which it may be saved. Drive assignments may also be changed from within the main program.

With a two-drive system, my method is to boot the program disk, and then to remove it from drive one and insert the dictionary disk. Drive two holds the data disk, and, like the printer setups, these assignments are saved to the master program disk so that the system is configured to my needs each time I boot up. The thesaurus resides on the flip side of the dictionary disk, but I tend to avoid using it because it leads to text such as: . . . *brought forth upon this continent a novel realm, conceived in leisure and dedicated to the proposition that all men are created equitable. . . .*

Should you choose to use the thesaurus in spite of this warning, you do so by highlighting the first letter of the word and pressing Open-Apple-T. If there are synonyms for the word, they'll appear in a box where you may choose a replacement by moving the cursor to highlight it and pressing Return.

The 60,000-word spelling checker is a more useful tool, and you may use it to check a single word or an entire document. When a misspelled word is encountered, it is highlighted and a list of possible choices appears in a pop-up window. Move the cursor to highlight the correctly spelled word, press Return, and it is inserted into the text. Should the word be simply unusual, or a proper name that may be frequently used, you can choose to have it ignored or added to the dictionary.

Documentation for *Bank Street Writer Plus* is very good. While it is aimed at the beginner in word processing, this tone of simplification makes the new features easier to understand for even the older hands. Three disks are included in the package, one containing the main program and, on the flip side, a tutorial. A second disk is a backup to the main program, and the last contains the spelling checker and the thesaurus. Should you have a hard disk system, both the spelling checker and thesaurus can be installed there, which should speed up their normally slow pace.

Of course, *Bank Street Writer Plus* does not have everything. I would appreciate being able to vary line spacing within a document rather than having to use one parameter throughout. Offsetting this, however, is auto page numbering, easy headers (but no footers), and the ability to save files in ASCII as well as binary form. I would also rather have a full preview option than the partial one included here, the chief use of which is to display page breaks.

But *Bank Street Writer Plus* is an excellent tool for the beginner. It will also be of value to the more experienced user who has felt the lack of onscreen help and such features as the spelling checker. When it comes to word processors, I am a tough customer and am difficult to please. That I've adopted *Bank Street Writer Plus* as a day-to-day tool means that it has passed some very tough tests.

Bank Street Writer Plus
Broderbund Software
17 Paul Dr.
San Rafael, CA 94903
$79.95 Apple versions
$99.95 IBM PC and compatibles

Might And Magic

James V. Trunzo

Requirements: Apple II-series computers (64K minimum), including Apple IIGS.

Might and Magic is an outstanding adventure game. This new release has the potential to take its place alongside *The Bard's Tale* and *Wizard's Crown* among the best in the genre.

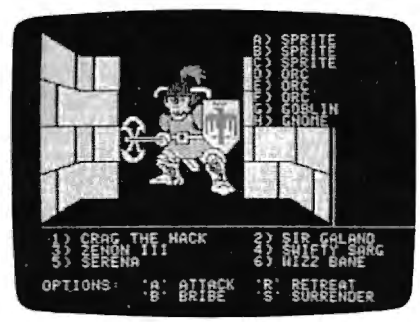
Might and Magic, all 500K of it (done entirely in machine language), contains just about every conceivable fantasy element crammed onto two double-sided disks. Over 4,000 individual locations, each graphically represented, comprise the 55 areas that make up the fantasy world of Varn. On Varn, towns, dungeons, castles, caves, wilderness, and even astral planes have their own themes, difficulty ratings, and special events. It is up to you to traverse this vast and varied fantasy world in order to gain wealth, experience, and the secret of the Inner Sanctum.

Standard Elements Rendered New

Before you can triumph, though, you must (as you might have guessed) assemble a party of adventurers of different races and character professions. While this may seem typical, *Might and Magic* makes more use of character types than other games. Even the gender of the character (something used only for "color" in most games) becomes a significant factor in one of the kingdoms which is decidedly anti-male. Alignment is crucial, too, because there are places where good guys just can't go . . . and vice-versa.

Once your group is assembled, it is time to go adventuring. Here, once again, you can perceive a difference between *Might and Magic* and other fantasy games. This game is much more than just "combat." People from beggars to kings populate the land of Varn, many of them possessing information of great value, others wanting you to undertake a quest for them. You may accept or decline as you wish. Strange writings on cave walls or riddles spoken by magical statues will send you off to distant parts of the land, looking for hidden treasures or powerful magic. Such puzzles, riddles, quests, and themes abound in the game, and it is up to you to accept or reject them, to solve or ignore them. Ultimately, all of these elements come together to lead you to solving the secret of the Inner Sanctum. Also, you venture through varied terrain, which adds to the variety of encounters—avalanches can be just as deadly as dragons.

Another feature that makes *Might and Magic* unique is its freedom of play. While other fantasy games possess impressive scope as far as the amount of exploration possible, they often lock you in, requiring you to work through one area before being able to access another. *Might and Magic* gives you free rein. Your party may travel anywhere, anytime. They may partially explore a castle, depart, explore a different castle, embark on a quest, and so on, before ever returning to the original castle. This isn't to say that entering some areas doesn't hinge upon information or items gathered elsewhere, but *Might and Magic* is less rigid than other games.



Might and Magic *provides players with a passport to a richly various—and dangerous—fantasy realm.*

Multiple Monsters

Of course, magic and combat do occur, as you want and expect them to do. But the tremendous range of monsters and magic in this game give it a freshness that sets it apart from other fantasy games. Two hundred different monsters may be encountered, each with its own set of statistics, including ratings for special attacks, magic resistance, friendliness, spell-casting abilities, missile weapons, aggressiveness, and more. Many of the more powerful monsters can regenerate. There's nothing more frustrating than scoring a major hit upon a demon, only to have it return to its initial state.

Magic comes in many forms. There are over 250 unique items (some of them cursed, so be careful). Their powers range from one-time use to unlimited use, and they can do things like alter a character's statistics, allow passage to a restricted area, or destroy anything with which they come into contact. Characters in the party who have the ability to cast spells have 94 spells spread over seven levels from which to choose. And, as mentioned before, magic may manifest itself in other ways, including talking statues, magical fountains, and illusionary walls.

Graphically, *Might and Magic* has few peers. Whether in a dungeon or outside in the wilderness, the 3-dimensional displays are delightful. Whether characters are crossing oceans, climbing mountains, walking down decorated castle corridors, or sneaking past dungeon cells, the game provides flicker-free, full-colored graphics. The monsters and treasures are well-represented, too. A note here: Because of the huge scope of this program, some sacrifices had to be made. One of them was in the nature of the monster graphics. Unlike *The Bard's Tale*, there is no animation nor are all members of mixed parties represented graphically in *Night and Magic*. The most powerful of the monster types is shown, however, and very nicely, too.

There's also icing on this cake. *Might and Magic* contains several additional features that further distinguish it. First of all, when all the characters in a party die, you aren't forced to start all over. You pick up at the last inn visited. The process does not require anything out of the ordinary, nor do you need special back-up disks. Also, it is easier for new characters to survive, providing you use good fantasy-game common sense and reject the temptation to fight "just one more time" or visit "just one more room." During the early stages of the game, *Might and Magic* gears its encounters to the playing level of the group, giving you a chance from the very beginning of the adventure.

Finally, the 54-page, spiral-bound manual strikes me as a refreshing change from the norm. It contains illustrations, examples, and information that fully explain all aspects of the game. It is easy to refer to when you're in need of a refresher course, and the chart of spells as well as the 18 × 12 fold-out map of the Land of Varn are worth their weight in the coin of the realm.

All in all, *Might and Magic* provided me with plenty of enjoyment. The game can take months to play—you won't easily exhaust its possibilities. This one is special.

Might and Magic
New World Computing
14922 Calvert St.
Van Nuys, CA 91411
$49.95

Space M+A+X

Keith Ferrell, Features Editor

Requirements: IBM PC, XT, AT or compatible, with 192K minimum memory, DOS 2.1 or higher, color graphics adapter; joystick optional.

The year is 1996 and you are responsible for launching, assembling, operating, and generating revenue from Space M+A+X—an orbiting, modular Materials, Astrophysics, and eXperimental station.

This exceptionally detailed package simulates the decisions involved as the various modules are placed in orbit and the configuration is brought to life. More than that, *Space M+A+X* simulates the costs and consequences of each decision, reminding you constantly of budgetary, personnel, and equipment constraints.

You take the role of space station project manager at one of five levels of salary and difficulty. As manager, you are responsible for selecting the crews and launching sequences that can best build the station and get it working within strict time and budget requirements.

At first it appears you have everything you need. In addition to a fleet of four shuttles, *M+A+X* provides several unmanned Heavy Lift Vehicles (HLVs)—essentially a 150,000-pound cargo container strapped to an external tank and four solid rocket boosters. The modules are ready for loading, and they include habitation, command, logistics (supplies), medical, recreation, experimental, and manufacturing facilities, as well as thrusters, pallet racks for exposing experiments to hard vacuum, remote manipulator arms, solar arrays, and heat radiators.

Schedules range from 70 to well over 100 days, and budgets from just under $3 billion to just under $4 billion. Crews are trained and flight-ready.

But space is *expensive*. While an HLV can heave several modules at once into orbit, the cost of such launches can exceed half a billion dollars. Solid rocket boosters are limited in number. Shuttles cost less to operate, but can lift less mass into orbit. Also, the shuttle crews and space station assemblers rightly receive generous daily salaries and incur daily support expenses. The shuttles themselves must be leased on a daily basis.

In short, everything in this simulation *costs*. Without careful planning, working capital can shrink quickly. And without working capital there's no way to deliver routine resupply missions into orbit, much less mount an emergency mission if circumstances require it.

Orbital Operations

Those circumstances change from mission to mission, as do the demands placed upon personnel in orbit as the space station takes shape. Once the first manufacturing modules are in place and activated, you face the constant challenge of supporting sufficient personnel to run the operations at maximum efficiency and productivity, as well as ensuring a constant supply of raw materials to be processed into profitable products.

Space M+A+X quickly reveals itself as a strategic simulation as well as an economic, scientific, and technological one. Early launches and assembly crews must establish power, habitation, and medical and recreation facilities while also provisioning the station. But a manager cannot wait too long to put manufacturing capabilities and operating crews into orbit—these are the resources that generate the revenue that will help make M+A+X self-supporting.

There are three types of manufacturing modules. Biological manufacturing produces pharmaceuticals and chemicals of a purity hard to obtain on earth. Furnace processing is used to produce high quality semiconductor crystals. Containerless processing allows for the production of perfectly spherical latex beads, which cannot be produced other than in zero gravity. Additional revenue can be earned from leased astrophysics and experimental modules.

The simulation is menu-driven, with an opening screen that allows the manager to select options such as cost breakdowns and objectives to load and launch HLVs and shuttles, to load for deorbit and select the proper landing site, and so on. Within each screen, further information is provided—weather and temperature which can have catastrophic effects upon launches and landings, availability of vital solid rocket boosters, amount of money and time left with which to achieve the required minimum configuration. One option permits your performance to be delivered to both your printer and your monitor.

Once a vehicle is launched, *Space M+A+X* provides a brief sequence of non-animated graphics showing the craft reaching orbit—or failing to. In orbit, another menu controls operations. When assembling the space station, one module at a time is moved into position, using either joystick or keyboard control. The rules for successful assembly are strict—each module must be separated from its mate by no more than one pixel. More or less than that and the assembly fails—at best costing time and money, at worst causing accident, injury, or even death for the assemblers.

Strong Nerves Required

At its most difficult level—Senior Project Director—*Space M+A+X* can be genuinely nerve-wracking. Weather and temperature become more critical than ever; launches and landings are more difficult to achieve. Crews are more assertive as well—the simulation posits a guild of orbital workers who can strike if conditions are unsuitable.

More seriously, *Space M+A+X* reminds the player of the enormous risk involved in every spaceflight. The simulation makes insurance available for launches and operations, but the premiums are exorbitant. Yet even with all risks minimized, some launches run into difficulty that result in emergency landings or even in the loss of a vehicle and its crew.

That a great deal of thought and effort went into *Space M+A+X* is nowhere more obvious than in its thick, beautifully produced manual. In addition to providing instructions for operating the simulation, the manual contains much technical information about the space program, the objectives of a space station, and the nature of orbital science and technology. A brief bibliography at the end of the manual offers further reading; to that list I might add Henry S. F. Cooper's *A House in Space*, about Skylab, and the just-published *The Space Station: A Personal Journey*, by former NASA executive Hans Mark.

The simulation comes on three disks, in copy-protected mode or in a version installable on a hard disk or backup floppies.

Solidly grounded in real-world economics and science, *Space M+A+X* is a challenging simulation that provokes and teaches even as it entertains. Author T. L. Keller and publisher Final Frontier Software are to be congratulated for their innovation and quality. The program is appropriately and touchingly dedicated to Sharon Christa McAuliffe, who would, I think, have appreciated *Space M+A+X* a lot.

Space M+A+X
Final Frontier Software
18307 Burbank Blvd.
Suite 108
Tarzana, CA 91356
$69.95 (copy-protected); $79.95 (backup and hard disk-installable)

Realms Of Darkness

James V. Trunzo

Requirements: Apple II-series computer (48K minimum), including IIGS; Commodore 64.

There was a time when any computer fantasy game became an immediate bestseller due to the genre's popularity and the scarcity of such products. That is no longer the case—computer fantasy games now compete in a buyer's market where they must meet certain standards if they hope to sell.

Sir Tech's landmark game *Wizardry* demonstrated the depth that could be achieved in a computer fantasy game. Products like Electronic Arts' *The Bard's Tale* and, recently, New World Computing's *Might and Magic* have elevated computerized role-playing fantasy games to new and exciting heights.

Strategic Simulations, which gained prominence as a pioneer in the field of simulated war games, has become an important player in the fantasy game field with the release of award-winning computer games including *Phantasie* and *Wizard's Crown*. Now, S.S.I. has released *Realms of Darkness*, a new role-playing fantasy game that equals the challenge and enjoyment of their previous games and, in some ways, advances the art of the adventure game.

Spells and Swords

Realms of Darkness contains the staples of all role-playing fantasy computer games. The game's environment encompasses a huge world in which to venture, one consisting of wilderness, shops, cities, and dungeons. Players assemble a party of adventurers comprised of various classes and races. Magic in the form of spells and talismans plays an important role and is a must if the expedition is to be a success. And there is enough swordplay and confrontation to satisfy even even experienced fantasy gamers. Each of these elements is done well in *Realms of Darkness;* each contains certain unique nuances that should interest even jaded adventurers.

What makes this new fantasy game special, however, are elements not previously found in games of this type. For one thing, your party can be split into smaller groups to explore separately any given area. Whether or not this is an advantage must be determined by the individual player; it's obvious that while no real "time" is saved, two groups can cover much more territory than one. The program handles the split group option clearly and easily, but the player may have more difficulty.

Another interesting feature is the merging of certain text adventure techniques with standard role playing techniques. For example, in addition to the standard practice of selecting a character's action from a predetermined and limited menu, dialogue boxes can be opened to allow any of the characters to converse with the inhabitants encountered during the course of play. Actual discussions, most of them divulging needed information, can take place. Furthermore, the success of such endeavors can often depend on your selection of which character to use as the negotiator or diplomat. High scores in skill areas such as wisdom and luck can often lead to better results.

Realms of Darkness *offers fans of role-playing games a heroic fantasy adventure in a strange and mysterious land.*

Sophisticated Parsing

In the same vein, the dialogue box can be used to issue orders to characters beyond the scope of the typical FIGHT, RUN, TALK, and SURRENDER commands. Like text adventures, *Realms of Darkness* provides excellent flexibility and removes many of the artificial limitations of straight role playing games simply because its parser understands commands like CLIMB, SWIM, INSERT, BUILD, and so on. *Realms of Darkness* expects you to use your intelligence as well as your brawn; it demands that you recognize that there are times when you need to SHOUT AT instead of TALK TO. Variety like this adds to players' enjoyment and enlarges the scope of the game.

Exemplifying a recent trend in role-playing fantasy games, elaborate puzzles occur throughout the adventure. Seven scenarios must be completed in order to win the game. Sometimes solving a puzzle completes the scenario; other times solving a puzzle merely advances you to a previously unattainable area.

Realms of Darkness is an elaborate production. The estimated 150 hours needed to play the game in its entirety speaks for the depth of the game. Playing through even the easiest of the scenarios demonstrates the sophistication of the program. While it can't be said that the game is only for experienced players, beginning players might be wise to read the excellent manual carefully and to follow the beginning tutorial to get a feel for the game. S.S.I. rates *Realms of Darkness* Intermediate Level (as a point of reference, *Phantasie* and *Phantasie II* were rated Introductory).

Graphics are good, though not spectacular, and they usually are presented in a ¾-screen format. There is no animation, nor are the dungeon walls and floor detailed to the degree found in, say, *The Bard's Tale*. On the other hand, the wilderness scenes and the interiors of buildings and so forth benefit greatly from the near full-screen technique employed.

One discordant note must be sounded, incidentally, though this may only bother fantasy purists (of which I am one). Certain science fiction elements have slipped into *Realms of Darkness* as have various contemporary sayings and modern-day items. For example, one scenario centers around an indestructable robot; elsewhere a sign appears stating "Kilroy was here!" And you may need to use a lawnmower to solve part of a puzzle. Hard-core fantasy devotees may find these occurrences irksome. They don't appear all that frequently, but they're hard to ignore when they do show up.

Beyond that, *Realms of Darkness* is a well-planned product with several interesting features not previously implemented in a fantasy game. Most fantasy gamers will want to take a look.

Realms of Darkness
Strategic Simulations
1046 N. Rengstorff Ave.
Mountain View, CA 94043
$39.95 ©

The Next Gutenberg Revolution

With the introduction of Atari's new laser printer for the ST, the price for a complete desktop publishing system has reached a new low. Ever since Apple's original entry into this field, *desktop publishing* has become the catch-phrase of the 1980s, and it seems that this new wave of enthusiasm has not yet begun to run out of steam.

To most people, desktop publishing provides cost-effective solutions to the document creation process for businesses of all sizes. Tasks that once required the services of outside typesetters are now performed in-house with a healthy savings in both time and money.

While this application for desktop publishing more than justifies its existence, this field has a greater power than meets the eye. In the case of corporation-based desktop publishing, the documents being published were going to be created anyway. The only benefit of the new technology was that it saved time and money. But the real power of desktop publishing comes when it is used to publish documents that would otherwise never be seen. To see why this is so, let's take a trip back in time.

In days of old
When books were sold
Through publishing on demand,
An author's dreams
Took years, it seems,
'Cause books were writ by hand.

Before Gutenberg, demand publishing was the only way books came to be. If you wanted a library of classics, you would hire a few dozen scribes and then wait for two years while they copied the books. There were no publishers as we know them, no bookstores, and almost no literacy among the general public.

All this changed in the centuries after the invention of moveable type. For the first time, books could be created so inexpensively that copies could be printed in advance of their sale. As the public became increasingly literate, publishers added more and more titles to their catalogs. Bookstores started to appear, and bookselling became a business in its own right. In other words, we went from a time where books were created by consumer demand to a time where they were created by publisher demand.

The introduction of the publisher between the customer and author has had its good and its bad sides.

A problem for many authors comes when they realize that no matter what friends may think, a publisher must first be convinced that their book is worthwhile. If you are an unpublished author, and are not in the news on a daily basis, it can be very hard to get anyone interested in your manuscript.

Even if your book is accepted by a publisher, it could be years before it gets into print. The result is that many authors feel that the established publishers have a stranglehold on the industry and that they end up acting as the arbiters of taste by deciding which books get published and which ones don't.

Of course, publishers are caught in a bind of their own. They can ill-afford to publish and promote books that no one wants to buy, and their cost for bringing a book to market is so high that they need to be guaranteed a good return on their investment. This is why the escapades of a movie star get more marketing dollars than the poetry of e. e. cummings.

Enter The New Age Of Publishing

Rather than bemoan your fate as an unpublished author, you can go into the book-publishing business yourself because of the accessibility of low-priced, high-quality desktop publishing systems.

I did this as an experiment last year when I published *Unlocking Personal Creativity*, a book I wrote using my Macintosh. I printed the master copy of the book on a LaserWriter using a heavy, clay-coated paper to produce a crisp image. The printing and binding was done in a local shop, and, in a few weeks, my manuscript had become a room full of books that I sold—and now sell—through direct mail and through local bookstores.

This is true freedom of the press.

If you have a message to convey and know how to reach your audience, self-publishing can be very rewarding in many ways. Of course, you should have your manuscript edited professionally and not be reluctant to ask for advice from experts in the field.

One of the most wonderful benefits of desktop publishing is that it has the power to free authors from the restrictions of big publishers—to give control back to those who created the words.

It will be interesting to watch the reaction of the publishing giants as more and more innovative books start to emerge from the smaller presses. Remember that when Apple got started, IBM issued a statement declaring that the personal computer field was outside its domain of interest. Will the big publishers say the same thing about personal publishing? Time will tell.

Meanwhile, Gutenberg would be proud.

Dr. Thornburg has a total of 12 books published by COMPUTE!, Addison-Wesley, and Random House. He now uses desktop publishing tools to publish books through his own company, Starsong Publications, where he has two titles in print. He welcomes letters from readers and can be reached at P.O. Box 1317, Los Altos, CA 94023.

©

Robert Evans Meets The Xerox 4020

Robert Evans is a multitalented guy.

One evening last fall he was at our Multi-Media Classrooms Project Launch celebration manning a movie-house popcorn machine. He brought the machine to our elementary school, set it up, and popped enough corn to keep over 100 children and adults happy during our program.

During the day, Robert is the computer "guru" for the chain of Video Showcase stores in Birmingham, Alabama. On weekends, he vanishes—into some dark and mysterious cave. Robert is a spelunker—an avid cave explorer—and recently he and his friends discovered a new cave in northern Alabama that some claim is the most important cave discovery in the U.S. in the last ten years. The cave is three miles long; it has underground rivers, a seven-story waterfall, and ceilings over 100 feet high.

Computing By Night

But it's at night, when he returns home, that Robert really enters his element. Waiting at home for Robert is his Amiga 1000, and Robert loves his Amiga with a passion.

I knew Robert was an Amiga expert, so when I got hold of Xerox's new 4020 color inkjet printer, I took it to him to review. Naturally the first thing he did was use it to map out his new cave—in color and in three dimensions.

He also discovered some other things.

Despite its formidable price tag ($1500 retail), and its fancy inkjet technology, the Xerox 4020 is easy to install. Robert took the printer right out of the box, glanced at the manual, and within half an hour had the printer hooked to his Amiga creating bright, colorful pictures.

Xerox has made the printer ribbon a thing of the past. In its place are four little ink tubes—filled with red, blue, yellow, and black ink. You place the ink tubes in their holders, and the tips are automatically opened, dropping the ink into a reservoir, ready for operation.

The printer takes specially coated paper—continuous-feed or single, cut sheets. The paper helps the ink dry quickly (in less than 30 seconds after being sprayed), and it bonds the ink onto the page so that it doesn't smear after drying.

Robert hooked the printer to his Amiga using a parallel cable, and he configured the Amiga operating system to talk to the printer using the Preferences function of the Amiga Desktop.

Robert tested the printer with *Aegis Draw*, *Aegis Images*, and *Deluxe Paint II*. The printer also works with *Graphicraft*, *Textcraft*, and other programs. With the graphics programs you can mix text and color drawings on the page. The printer mixes the four colors of ink as it sprays them, so it can create a variety of different colors. Text and images are so crisp and clear that it would be easy to mistake them for typeset or laser-printer output—except they're in color.

But you must be patient. When Robert hooked up the printer, his first several pictures (downloaded from a local bulletin board) were almost unrecognizable because they were so smeared. Then, suddenly, the printer settled down and printed picture after picture perfectly. It was remarkably quiet—so quiet, Robert said, that you could hear a pin drop.

After getting comfortable with the printer, Robert learned that he could use its wide carriage to create extra-wide images and columns of text and figures (up to 132 characters per line). And unlike an impact (for example, dot-matrix) printer, the Xerox 4020 can print pictures and text directly onto transparencies. This feature is a boon to managers, teachers, and trainers who need colorful graphics for speeches, meetings, and classroom presentations. You can take the transparencies fresh off the Xerox 4020, put them on an overhead projector, and display them.

Robert learned that if he printed text along with simple diagrams and boxes, the printer whisked across the page quickly, and he was able to create camera-ready newspaper ads for his Video Showcase stores.

(The Xerox 4020 works on several popular computers, including the IBM PC and PC compatibles, the Apple II series, and, of course, the Amiga. If you would like more information about the Xerox 4020, write Connie Dunlap, Xerox Square, Fifth Floor, 100 Clinton Ave., Rochester, NY 14644-1877, or call 1-800-TEAMXRX—ext. 199A.) ©

All the programs in this issue are available on the ready-to-load *COMPUTE! Disk*. To order a one-year (four-disk) subscription, call toll free **800-247-5470** (in IA 800-532-1272). Please specify which computer you are using.

Microscope

Sheldon Leemon

After last month's less-than-enthusiastic recounting of the "innovative" features of the new IBM PS/2 line, a reader complained that my comparisons to machines like the Amiga, the Atari ST, and the Macintosh weren't altogether fair. For example, why hadn't I mentioned the IBM's superior music capability? "Which one is that?" I asked. "Why, the built-in 32-voice synthesizer, of course," he replied. I explained that though I'd read all of the technical releases from IBM, the closest thing to what he was describing had been an add-on music card that would provide an 8-voice synthesizer and MIDI connectors for about $700. For that price, I explained, you could get a pretty fair MIDI synthesizer with a keyboard. And besides, the card would fit only in the old-style expansion slots, which means you couldn't even use it on any of the new machines but the Model 30. Plus, it isn't available yet.

"Well," he shot back, "what about that Micro Channel? Is that available yet?" I explained that *Micro Channel* is the name IBM uses to describe the new I/O bus on the Model 50 (and higher models). While that architecture is, by all accounts, pretty zippy, its real importance can be seen in terms of IBM's networking plans. If IBM plans to send graphics information from its Presentation Manager over the network, it has to be pretty fast. Of course, for individual users, who aren't going to be running out to buy the Extended Edition of OS/2 at $800 a crack, the Micro Channel may not be quite so important.

This conversation reminded me that, to an awful lot of people, the word *computers* means IBM, and Big Blue can do no wrong. The 68000 computers may have been first with 3½-inch drives, analog monitors, and direct addressing of megabytes of memory, but IBM's ability to produce full-color 24-page magazine inserts as well as TV ads featuring the cast of "M*A*S*H" still counts for something. Enough, probably, to retain the loyalty of corporate America.

****

Whatever else you think about IBM's product announcements, you have to admire the company for keeping quiet until it actually had products to sell. Companies like Commodore and Atari could do well to follow that example. Both announced new computers early in the year, and both may be regretting it about now. At the January CES show, Atari announced its Mega ST line. This improved version of the current STs is to offer more memory, and a blitter chip for faster graphics. At the same time, Atari surprised everyone by announcing a line of low-cost PC-compatible computers with no expansion slots, but with built-in EGA video adapters. The new STs were slated for a March introduction, with the PCs following in April or May. Unfortunately, time has not been kind to Atari. The price of the one-megabit RAM chips that they're using in the Mega series has not come down as quickly as expected, and production schedules continue to slip. Lately, Atari has been telling dealers not to look for Mega STs until July, with the PCs to follow in August. In the meantime, the new IBM machines have made VGA the new de facto video standard, blunting much of the impact of Atari's built-in EGA.

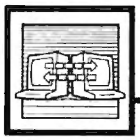
Commodore's position isn't much better. They officially announced two new Amiga models in March, but delivery dates of May and June seem to be stretching into late summer. The fact that the Sidecar still hasn't shipped and that its price has jumped from "well under $1000" to $995, hasn't helped Commodore's credibility. The firing of Tom Rattigan, along with a large number of Commodore staff, has cast yet another pall.

Though the Amiga and ST both represent advanced technology at a low price, both are still on somewhat shaky ground. While sales for both machines have been respectable, neither seems to be gaining the momentum necessary to make it an unqualified success. And they're sure not picking up any steam while the buying public waits for new models to arrive.

****

One of the rumored reasons for Rattigan's departure from Commodore was his reluctance to push the new Amiga 500 into mass-market distributions channels as Commodore Chairman Irving Gould wanted. If Gould gets his way (and with 20 percent of the stock, he probably will), we may see yet another test of whether a 16-bit computer can repeat the success of the Commodore 64 in mass merchandise outlets. The first to try was Atari, who attempted to distribute the 520ST through outlets such as Toys "R" Us. But sales through such channels have been lukewarm at best, despite a system price that compares favorably to that of a Commodore 64 with disk drive and monitor. The next 16-bit machine to hit Toys "R" Us was the Blue Chip, a $700 PC-clone from Korean conglomerate Hyundai. From all accounts, its Christmas sales were very disappointing to mass merchants.

Since the prices of these computers are not much higher than those of the previous generation, could it be that their level of sophistication makes them unsuitable to be sold like VCRs? Or is it just that neither Atari nor Blue Chip has produced the kind of advertising blitz that led to the success of the 64?©



Telecomputing Today

Arlan R Levitan

A Conversion Experience

Telecomputing can sometimes take on religious overtones. There are believers and nonbelievers. And then, there are converts.

It all started innocuously enough. My wife and I had invited our neighbors, Dan and Phyllis, to come over for lasagna. As dinner ended, we entered the Slouch Back with Eyes Half-Closed mode.

"Say, Arlan," mused Dan. "I've been having a little trouble with one of my Macintosh diskettes. Call it coincidence, but I just happen to have it in my jacket pocket. Would you mind checking it out?"

An experienced translator of computer-hobbyist catch phrases, my wife turned to Phyllis and without batting an eye pronounced, "That's the last we'll see of them for at least an hour and a half."

"No Problem, Dan. . . ."

"You still messing around with modems?" Dan asked as we climbed the stairs. "To be honest with you, I never found a real use for mine."

That hurt. Years ago I had talked Dan into purchasing a inexpensive direct-connect job for his Atari 800. Over time, many demos of information services and bulletin boards had failed to strike a responsive chord in my friend. Since then he had replaced the trusty old 800 with a Mac. "Hey, if you know anyone who wants one, I'll let mine go for a song. I haven't bothered to hook it up to the Mac."

I fired up my Mac Plus, pausing a few seconds for the system's hard drive to come up to speed before turning on the Mac itself. "I wouldn't be so quick to dump that modem, Dan. You never know when it will come in handy."

After a few seconds, the familiar Mac Desktop appeared. I slipped Dan's diskette into the system drive and asked, "Now what seems to be the problem here?"

"I think I did something to the disk. Every time I start up *MacWrite* I get a system failure." I double-clicked on the *MacWrite* icon and, sure enough, the system locked up.

I turned the equipment off and flipped through my Mac disks. "No problem, Dan; I'll just put a fresh copy of *MacWrite* on another disk and move your text files over to it." I ejected Dan's suspect disk, casually restarted the system, and waited for the Desktop to reappear. Instead, I got the following message: *This is not a Macintosh disk: Do you want to initialize it?* I thought of the 15 megabytes of data on the hard drive and powered off the system.

"What version of the Finder [an integral part of the Mac's operating system] was on that diskette?"

"Um, I think Finder 1.0."

I cursed myself for my own thickness.

Starting up Dan's blasted version of *MacWrite* had polluted my machine's copy of the operating system. I calmly rebooted my system from a floppy and tried to access the hard drive, only to be greeted by the same dreaded message. I frantically grabbed for the box containing my most recent system backup. It was three months old. I turned to my ex-friend, contemplating the most suitable height for a new, electric barbed-wire fence between our homes.

Dan remained remarkably calm while I did a rendition of Gene Wilder's "mad" scene from *Young Frankenstein*.

As the noise level approached that of WrestleMania III, our wives ran upstairs. It took both of them and my kids to break the headlock I had on Dan's cranium.

First Aid

After spending suitable time in a neutral corner, I called John, a friend who works as a technical support manager for Apple, and explained my plight. "Sounds particularly nasty, Arlan. There's about a 50/50 chance that our Disk First Aid utility will fix your problem."

"I don't have a copy, John."

"Got your modem? Have your system call mine in five minutes. I'll send you the latest version."

I slapped a communications program in the system's internal drive and brought the system up without the brain-damaged hard drive. In a few minutes First Aid was on its way.

I explained what was going on to Dan. He was mildly impressed with the fact that we could actually send the hoped-for cure for our ills from system to system. He became more impressed as he realized that he wasn't going to be coerced into motoring 50 miles in driving rain to get the digital medicine.

About 15 minutes later the file transfer was complete. Disk First Aid was invoked and churned away at the hard drive for what seemed an eternity. Eventually the program ended, reporting that its surgery was complete. We crossed our fingers, dropped back five, and punted. The Mac groggily stirred to life, displaying the familiar Mac happy face that indicated that all was well with world. A quick examination of the drive showed that nothing had been lost.

A wave of relief rolled through the room, replacing angst and hard feelings with camaraderie and good cheer. We all took a vote and decided that the occasion merited cracking one of the bottles of '68 Louis Martini Cabernet Sauvignon that had been languishing in my cellar.

As we toasted the memory of Emil Baudot, Dan mused, "You know, maybe hooking up that old modem to my Mac wouldn't be such a bad idea. . . ." ©

The Beginner's Page

C. Regena

Program Loops

The computer executes BASIC program lines in numerical order unless the program tells the computer to do otherwise. (An exception is Amiga BASIC, where lines are executed in physical order unless the program instructs otherwise.) There are several ways to transfer control to a different line. This month we'll discuss one of those ways: looping.

GOTO

GOTO tells the computer to *go to* a another line specified by a line number (or to a line label in Amiga BASIC and Atari BASIC). Some examples are:

```
150 GOTO 390          (transfer to line 390)
550 GOTO WHEELS       (transfer to line labeled WHEELS)
```

You can transfer to a previous line, a later line, or even the same line. A loop is created when the computer executes a statement or several statements repeatedly. If you are in the middle of a GOTO loop, you can stop the computer by a pressing a break key or key combination—quite often Control-C; press RUN/STOP on Commodore computers.

Here is an example of a program using GOTO statements to alter the normal flow of a program:

```
20 PRINT "ONE"
30 GOTO 60
40 PRINT "TWO"
50 GOTO 80
60 PRINT "THREE"
70 GOTO 40
80 PRINT "FOUR"
90 GOTO 90
100 END
```

Instead of printing the words *ONE, TWO, THREE, FOUR* in order as they appear in the program, the computer moves around. First the word *ONE* is printed; then the computer is instructed to GOTO line 60, which prints *THREE*. Next the computer executes GOTO 40, which branches back to line 40 where *TWO* is printed. Then the computer finds GOTO 80, which prints the word *FOUR*. Line 90 says to GOTO 90, which means the computer will repeatedly execute line 90—it will be stuck in a loop. You don't actually see anything happening on the screen, but the program will not end, so you know you are in a loop and need to break out of the program to regain control of the computer. Sometimes this type of loop is used to keep something (such as graphics) on the screen.

Another type of GOTO loop could be like this:

```
20 PRINT "HELLO"
30 GOTO 20
```

And here is a GOTO loop using a variable:

```
20 A=A+1
30 PRINT A
40 GOTO 20
```

FOR-NEXT

The FOR and NEXT statements create a loop that is executed a specified number of times before the program continues. Here's an example:

```
20 FOR C=1 TO 5
30 PRINT C
40 NEXT C
```

In the example above, the variable C (use any variable name you wish) is a *counter* or *index*. Line 20 says to start the counter C at 1 and proceed until C is equal to 5. Line 30 prints the value of C. Line 40 designates the end of the loop with NEXT C, which increments C by one. The computer checks to see whether C has exceeded the limit of 5. If not, the program transfers to the statement directly following the FOR statement. This process continues until the limit is exceeded; then the program continues with the line after NEXT. When C is printed in this example, C will be 1, 2, 3, 4, and 5. When C is 6, the loop finishes, and the program segment ends.

The counter variable does not have to be used within the loop; it can be used simply to run the loop a certain number of times, as in the following:

```
20 FOR T=1 TO 8
30 PRINT "HI"
40 NEXT T
```

The increments do not have to be by one. You can specify a STEP size. Suppose you want to count by twos:

```
20 FOR N=0 TO 10 STEP 2
30 PRINT N
40 NEXT N
```

The STEP size can even be a fraction:

```
20 FOR X=1 TO 4 STEP .5
30 PRINT X
40 NEXT X
```

The STEP size may be negative, which means the counter (or index) would be decreased each time:

```
20 FOR J=10 TO 0 STEP -1
30 PRINT J
40 NEXT J
```

Any of the numbers in the FOR statement may be variables. For example, if you have previously defined or calculated A, B, and S, you may use

```
20 FOR N=A TO B STEP S
 .
 .
 .
50 NEXT N
```

There can be any number of statements between the FOR and NEXT statements, but there must be a NEXT statement to correspond to each FOR statement. You can even create nested loops, or loops within loops. When working with nested loops, you must make sure your second loop is totally contained within the first loop as the following lines show:

```
20 FOR A=1 TO 3
30 FOR B=1 TO 5
40 PRINT A;"*";B;"=";A*B
50 NEXT B
```

```
60 PRINT
70 NEXT A
80 END
```

If there are no statements between a FOR statement and a NEXT statement, the computer simply counts, which creates a delay during program execution. An example is:

```
20 PRINT "ONE"
30 FOR DELAY=1 TO 800
40 NEXT DELAY
50 PRINT "TWO"
60 END
```

WHILE-WEND

WHILE-WEND loops (not available in all BASICs) are similar to FOR-NEXT loops except that, as a programmer, you do not need to specify limits or calculate a number of times the loop needs to perform. The computer performs the loop WHILE a certain condition is met. The loop is ended with WEND which can be thought of as WHILE-END. Here's an example:

```
20 WHILE SCORE<10
   ...(programming for a game)
780 WEND
790 ...(programming for end of game)
```

Here is another example of a WHILE-WEND loop. The computer performs the loop WHILE the name entered is not *REGENA*. Therefore, when the name *REGENA* is entered, the loop will end.

```
20 WHILE NAME$<>"REGENA"
30 PRINT "ENTER A NAME."
40 INPUT NAME$
50 WEND
60 PRINT "LOOP ENDS."
70 END
```

©

All the programs in this issue are available on the ready-to-load *COMPUTE! Disk*. To order a one-year (four-disk) subscription, call toll free **800-247-5470** (in IA 800-532-1272). Please specify which computer you are using.

Atari *Laser Chess* And Biker Dave

Some users have had difficulty getting the Atari versions of *Laser Chess* (June 1987) and "Biker Dave" (November 1986) to run properly. Both of these programs expect that certain variables will be located at the beginning of BASIC's variable table. "The Automatic Proofreader" program uses BASIC variables, and BASIC does not clear out its variable table when you type NEW, so the critical variables may not appear where intended after these programs are typed in using the Proofreader.

To create a working version of either program, load the program as you typed it in and list it to tape or disk (that is, use a LIST command, not a SAVE command, to store the program). Turn the computer off and back on; then use the ENTER command to reload the listed version. This eliminates the improper variable table. At this point, you can create a version that can be loaded with the LOAD command (which works faster than ENTER) by using SAVE to save out a new copy of the program.

Atari Disk Sector Editor

This powerful disk utility (May 1987) works as listed, but imposes an unnecessary limitation on the editing of disks formatted in DOS 2.5's enhanced-density mode. As presented, the program will not allow the editing of sectors above 1010 on an enhanced-density disk. However, the highest sector on an enhanced-density disk is 1023, not 1010. A newly formatted enhanced-density disk has 1010 free sectors; the remaining sectors are set aside for the Volume Table of Contents (VTOC). To provide access to sectors 1011–1023, change the value 1010 in lines 690 and 710 to 1023, and change the (720 + DENSITY * 290) in line 1340 to (720 + DENSITY * 303). Thanks to John Jennings for pointing out this oversight.

Font Printer For The IBM PC/PCjr

A number of readers have written to complain about the fact that the 25 bonus font files included on the COMPUTE! Disk with this program from the June issue were not printed in the magazine as well. It is our policy to include in the magazine everything that appears on the quarterly disk, but in this particular case that wasn't feasible. The combined font files were almost 120,000 bytes long—which would have translated to about 60 magazine pages of listings. We suspect that even the most proficient typist would have found the task a bit daunting. ©

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Donald B. Trivette

What To Do About Junior

Recently I've been getting a lot of mail about PCjrs. There are all kinds of schemes and plans for adding memory, second disk drives, and hard disks. Some may work, while others sound dubious at best. One California Junior owner said that he has added 512K, a second disk drive, and software to simulate a DMA channel. His PCjr now runs two or three times faster, and he obviously enjoys tinkering with his computer as much as using it.

On the other hand, a woman from Mississippi wrote that she had spent many hundreds of dollars to add features to her PCjr, but that she still couldn't run some of the programs at home that she used at the office. She wondered if she could add a hard disk.

A Canadian wrote that he heard he could increase Jr.'s memory by removing the old memory sockets and installing new ones to hold 256K chips. This is not a do-it-yourself project—a technician wanted several hundred dollars to perform the conversion. No guarantees. He wanted to know, would it work?

The point, it seems to me, isn't whether it's technically possible to enhance the IBM PCjr, rather whether it's economical. As almost everyone must know by now, IBM announced a new line of personal computers—the Series/2—and replaced Charlie Chaplin with the gang from "M*A*S*H" as spokespersons. It also dropped the price of many products, including the PC. If the new Series/2 machines prove popular and cost effective, as it appears they are, the price of PC compatibles is bound to drop sharply in the coming months. That, along with people wanting to sell old PCs, is sure to make for some real bargains.

An Alternative

Instead of spending three or four hundred dollars on your PCjr, it might be better to put that money toward a used computer. Look for a basic 128K second-hand IBM PC in the $500–$600 range. Then you can add memory, clock/calendar, and hard-disk with the confidence that the money is being well spent. The IBM PC is going to be the Model T of personal computers; and if you know your automotive history, you know that it will be useful and serviceable a decade from now.

The question is where to look for used machines. I've not heard of any dealers that take old computers as trade-ins, nor do I know of any second-hand dealers. Newspaper ads and computer clubs are two leading sources for used machines, and if you live near a Fortune 500 company, call the director of information services and ask how he or she disposes of old hardware (but chances are employees get first crack).

Although there's no reason a used computer shouldn't be just as good as a new one—chips don't wear out like transmissions and water pumps—the same can't be said of mechanical devices. Avoid buying used printers. But do try to get a written warranty on the computer. As anyone who's ever seen "The People's Court" knows, *written* is the key word. Baring that, take the computer on approval for two or three days.

There's nothing you can do to insure that the power supply won't fail in a week or a memory chip won't go out tomorrow. Things like that happen—even with brand new machines—and there's no way to predict them in advance. But you should try to obtain some guarantee that the machine functions normally when you get it. Most problems will show up when the system is first turned on, or after many hours of operation. Heat builds up when a machine runs and may cause weak components to fail. When you bring the computer home, leave it on for a 48- or 72-hour burn-in. (This is a good test for new computers, too.)

Keep It For Fun

Maybe you'll want to sell the PCjr, or better yet, keep it for running entertainment software. If you keep Junior for games, you'll want joysticks if you don't already have them. Several years ago I paid around $60 for the official IBM PCjr Joystick—now you can get one for $14.50 from a company that specializes in surplus electronic items. It's new, original equipment, with the IBM logo and instruction booklet, but the connector is the PCjr type, so it won't fit the serial plug on the PC. (For the PCjr joystick, order item TM24K205 from the H & R Corporation, 401 E. Erie Ave., Philadelphia, PA 19134; phone 215-426-1708.)

Once you have the joysticks, you'll want to try them out, and there's no better program for that than *One-on-One*, an action basketball game that pits Julius Erving against Larry Bird. This game has been around for several years, so the price has dropped to a very affordable $15. It's still fun to play, and the graphics on the PCjr are probably why you bought the PCjr in the first place. (*One-on-One* is published by Electronic Arts, 2755 Campus Dr., San Mateo, CA 94403.) ©

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AmigaView

Sheldon Leemon

All About Icons

Icons, the little pictures that appear on the Workbench and its windows, make it easy to perform such actions as duplicating a disk or running a program. But because of their power, they generate a lot of curiosity—and questions. "How can I make my own icons?" "Why do some icons run programs when I double-click on them, while others do nothing?" "How can I increase the stack size for a program that's run from the Workbench?" To answer these questions, let's look at what icons are, and how they work.

Icons are pictures that represent actual objects in the Amiga disk filing system, such as disks, subdirectories, and files. Where do these icons come from? Information for each icon is stored in its own disk file. These files have the same filenames as the objects they represent, with the characters *.info* tacked onto the end. For example, the file that contains the icon information for the Preferences file is called *Preferences.info*, and the file that contains the icon information for the System directory is called *System.info*. In order for an icon to correctly represent a filing-system object, the *.info* file *must* be in the same directory as that object. The *.info* files contain a lot of information about the icon and the object it represents, including:

• *The image used to draw the icon on the screen.* This includes information about how to highlight the image when it's selected. It's even possible to use one image for the normal appearance of the icon and an altogether different image for its highlighted state. We've all seen these "action" icons. While the IconEd tool in the System drawer of the Workbench won't let you create two-image icons, you can create two separate image files with it and merge them with the IconMerge program on the Extras disk for AmigaDOS version 1.2.

• *The type of object the icon represents.* The Disk-type icon represents an actual floppy, hard, or RAMdisk. When you double-click on it, it opens a window which displays the files in its root directories for which there are icons. The Drawer-type icon represents a subdirectory. When you double-click on it, it opens a window which displays its icon files. The Tool icon represents an executable program, like a word processor. When you double-click on it, it runs the program. A Project icon represents a data file created by a Tool, like a paint program picture, or a text document. Normally, this type of icon won't do anything when you double-click on it, since data can't just load itself. But it's possible to designate a default program to run when a Project icon is selected. If that's done, double-clicking a Project icon will both run the program and load the data file. Finally, the last icon type is Garbage. This type of icon represents the Trashcan, which is a special kind of Drawer. The only difference between the Trashcan and any other subdirectory is that when you select the Empty Trash menu item from the Workbench, all of the files in the Trashcan directory are deleted. When you double-click on the Trashcan icon, a window opens to displays its contents like any other drawer.

• *The default Tool (the program to be run when this icon is double-clicked).* This applies only to Projects and Disk-type tools. The most common problem here is that the Tool might not be where this icon is looking for it. For example, if the tool is *AmigaBasic*, and the AmigaBasic program isn't in the root directory of this disk, the icon won't be able to find and load it. Notice that the default Tool of a disk is *Sys:System/Diskcopy*. That's how the Workbench duplicates a disk when you drag its icon over another disk icon.

• *Tool Types.* These are text strings which correspond to the command line parameters in the CLI. For example, if you open a new CLI window from the CLI itself, you can specify its size and position by using a command like *NEWCLI con:10/10/540/150/mywindow*. You can do the same thing when you open a CLI window from the CLI icon by using a Tool Type text in the icon like *windowname = con:10/10/540/150/mywindow*. Not every Project tool uses Tool Types, but those that do can offer the user the option of configuring in the programs started from the Workbench in a certain way.

• *The horizontal and vertical position of the image in the display window.* For Disk- and Drawer-type icons, information about the size and location of the window that they open is also saved here. These items in the disk file are altered when you use the Snapshot menu item from the Workbench. But remember, each icon has its own file, and Snapshot affects only the items currently highlighted. If you want to save a window's size and position along with its contents, highlight the drawer and all of the icons in the window at the same time (by holding down Shift while you select icons) before using Snapshot.

• *Stack Size.* This is the amount of scratch-pad memory allocated to the program. If no size is set, the default 4K is used.

If you want to learn more about a particular icon and the object it represents, highlight the icon and select Info from the Workbench menu. A window will appear that not only gives you all of the information shown above, but will also allow you to edit such fields as Stack Size, Default Tool, and Tool Types and save the changes. ©

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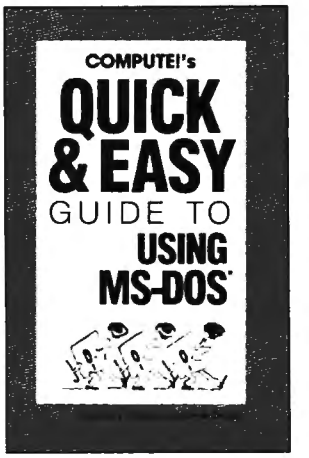

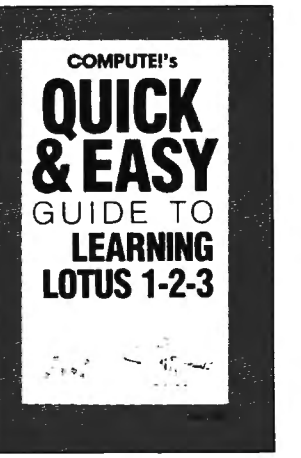

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Page Flipping

Like many other microcomputers, the Atari ST has the ability to flip from one display screen to another almost instantly. While you're looking at one screen, a program can be secretly preparing a second, hidden screen in the background. As soon as the hidden screen is ready, you flip to that one, concealing the first.

Page flipping has many uses. In a word processor or database program, for instance, you might prepare several hidden help screens when the program starts. When the user requests help, you can display any of the help screens instantly. It's a slick solution that doesn't involve the delay of writing each help screen from scratch or the uncertainty of having to read a help file from disk.

This month we'll demonstrate two different approaches to page flipping. Both programs do essentially the same thing: They prepare two different screens and let you flip between them by pressing any key (press ESC to quit). But the methods are somewhat different.

Program 1, written in C, illustrates the conventional method of page flipping. The XBIOS routine known as Setscreen allows you to reset the ST's physical screen base and/or logical screen base. The physical base tells the ST's hardware which memory area to display on the screen, and the logical base tells the system where to send screen output. Program 1 sets up two screens in memory—the original screen and an alternate screen. Each time you press a key, the program swaps the screen addresses and calls Setscreen to display the active page. When you exit the program, it flips back to the original screen and deallocates the memory used for the alternate screen.

You could use the same method in *GFA BASIC*, since that lan-

Program 1: Page Flipping In C

```
/* Short demonstration of page flipping on the ST */

/* Definitions for GEMDOS and XBIOS routines */
#include <osbind.h>

/* Line A commands to turn mouse off and on */
#define MOUSE_DIE asm { DC.W 0xa00a }
#define MOUSE_LIVE asm { DC.W 0xa009 }

long hidden_page, active_page, temp;
char msg1[ ] = "This is the original screen." ;
char msg2[ ] = "This is the alternate screen." ;
char msg3[ ] = "Press ESC to exit, any key to flip." ;
char crlf[ ] = { 13, 10, 0 } ;

main( )
{
    int key, foo;
    long mem_chunk, page1, page2, log;

    page1 = Physbase( );  /* Get physical screen base */
    log   = Logbase( );   /* and logical screen base */

    /* Get enough memory to hold the alternate screen. We need */
    /* 32,000 bytes plus enough to align on a 256-byte boundary */
    mem_chunk = Malloc(0x8100L);

    /* Find page-aligned address within our chunk */
    page2 = ( mem_chunk | 0xff ) + 1;

    active_page = page1; /* Original screen is active */
    hidden_page = page2; /* Alternate screen is hidden */

    MOUSE_DIE             /* Hide mouse for the moment */
    Cconws(crlf);
    Print_it(msg1);       /* Print message on original screen */
    Flip( );              /* Flip to alternate screen */
    Print_it(msg2);       /* and print message there */
    Print_it(msg3);
    MOUSE_LIVE            /* Show mouse again */

    foo = 1;
    while (foo)           /* Endless loop (loop until we break) */
    {
      key = Crawcin( );   /* Wait for keypress */
      if (key == 27) break; /* Exit if it's ESC */
      else Flip( );       /* Flip screens otherwise ... */
    }
    Setscreen( log, page1, -1L); /* Restore the original screen */
    Mfree( mem_chunk );   /* Release memory we grabbed earlier */
} /* end of main */

Flip( )
{
    MOUSE_DIE
    /* Swap the screens */
      temp = hidden_page;
      hidden_page = active_page;
      active_page = temp;
    /* Display the active page */
      Setscreen( active_page, active_page, -1L );
    MOUSE_LIVE
}
Print_it( message )
char message[ ];
{
    Cconws(crlf);
    Cconws(message);
}
```

Program 2: Page Flipping In GFA BASIC

```
' GFA BASIC Page-flipping Demonstration
'
' DIMension string array to hold screen images
Dim Screen$(1)
' Draw first screen
Circle 100,51,100
Deffill 1,2,9
Fill 100,100
For J=1 To 5
  Print
Next J
Print Tab(4);"This is page one"
' Save image in Screen$(0)
Sget Screen$(0)
' Draw second screen
Cls
Print
Print Tab(4);"This is page two."
Print Tab(4);"Press any key to flip screens."
Print Tab(4);"Press ESC to exit."
Box 5,5,300,40
Deffill 1,2,16
Fill 100,100
' Save image in Screen$(1)
Sget Screen$(1)
' Flip screens 50 times
For J=1 To 50
  Flip
Next J
' Flip at your leisure
X=1
While X
  Flip
  Waitkey
  If Key$=Chr$(27) Then
    X=0
  Endif
Wend
Edit
'
Procedure Flip
  ' Exchange these variables
  Swap Screen$(0),Screen$(1)
  ' Display Screen$(0)
  Sput Screen$(0)
Return
'
Procedure Waitkey
  Key$=""
  While Key$=""
    Key$=Inkey$
  Wend
Return
```

guage gives you access to system routines, but it also includes BASIC commands that make the job even easier. Program 2, written in *GFA BASIC*, begins by DIMensioning a two-element array named Screen$. After drawing the first screen, we use SGET (Screen GET) to capture the entire screen image and store it in the first array. Then we clear the screen, draw the second display page, and SGET that one into the second array.

Now there are two screens stored in memory—one in Screen$(0) and the other in Screen$(1). Time to use two more interesting *GFA BASIC* commands: The SPUT command lets you copy any screen-size string into the current display screen, and SWAP can exchange any two variables. The procedure named Flip performs a SWAP to exchange Screen$(0) and Screen$(1), followed by SPUT to display whatever happens to be in Screen$(0).

Because SPUT does a screen copy, we're not doing exactly the same thing as in Program 1. Rather than swap pointers with Setscreen, SPUT presumably copies the contents of the string directly into physical screen memory, a somewhat slower operation. The slight difference in speed won't matter in most applications, however, and nearly everyone will find the BASIC program easier to understand. To show how fast *GFA BASIC* can flip the screens, the program does 50 rapid flips before turning control over to you. If that's not fast enough for you, it's a fairly simple matter to call the Setscreen routine as in Program 1. ©

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INSIGHT: Atari

Bill Wilkinson

Graphics: From BASIC To ML

As promised, this month I will introduce you to how Atari BASIC (and, indeed, virtually every other language available for the 8-bit Atari machines) "talks" to the Atari Operating System (OS). It is important first to note that Atari BASIC has *no* built-in graphics subroutines. All graphics support in these machines comes directly from the OS. Today, this is not much of a revelation: The Atari ST, Apple Macintosh, and Commodore Amiga machines all come complete with an OS that supports numerous sophisticated text and graphics functions. To use these features with any given language (BASIC, C, Pascal, or whatever), the language designer only needs to provide the user with a simple interface and then to let the OS do the real work.

When the Atari 8-bit machines first appeared, though, they were unique in providing this kind of interface in a family of low-priced machines. For example, the Commodore 64 has *no* graphics whatsoever built into its OS, and the Apple II (up until the IIGS) had only limited low-resolution capabilities. Generally, such machines are *not* very friendly things to write assembly language for, in marked contrast to the Atari 8-bit models. (Looking back, if we Atari loyalists have any regrets or complaints, they might be only that Atari never produced the software tools—for example, computer languages—to fully exploit the capabilities of the OS. Other companies produced those languages—such as the Pascal from Kyan Software and BASIC XL/XE from my employer, OSS—but they never achieved the success that a language from Atari could have.)

The above history lesson was not entirely an exercise in nostalgia. It leads us to a very important point: If Atari BASIC didn't have any graphics-oriented statements built in, you could *still* perform graphics fairly easily. Let's take a look at some Atari BASIC equivalents:

```
10 GRAPHICS mode
```

is actually the same as

```
10 TEMP = 12: IF mode<16 THEN
   TEMP=TEMP+16
11 CLOSE #6: OPEN #6,TEMP,mode,"S:"
```

Do you see what we did? The GRAPHICS statement is really just a special kind of OPEN. (Actually, I have left out consideration of the "+32" modes and have simplified things a bit, but for 99 percent of all programs the above will work fine.) In other words, all of the graphics modes of the Atari 8-bit computers are *built into* the OS ROMs (Read Only Memory chips).

The simplest BASIC statement to emulate is COLOR—you can leave it out altogether. We'll take a look at why when we get to PLOT in a moment. But POSITION isn't much harder (if we ignore GRAPHICS modes 8 and 24—see below).

```
330 POSITION xpos,ypos
```

can be emulated via

```
330 POKE 85,xpos: POKE 84,ypos
```

And, once POSITION has been dispensed with, PLOT becomes easy, also. (As you study these conversions, see if you can figure out why and how they need changing for GRAPHICS modes 8 and 24.)

```
281 PLOT xpos,ypos
```

becomes

```
281 POSITION xpos,ypos: PUT
    #6,mycolor
```

which, in turn, can be changed to

```
281 POKE 85,xpos: POKE 84,ypos: PUT
    #6,mycolor
```

Incidentally, *mycolor* is the color value you would otherwise have specified in the COLOR statement. And I am purposely using lowercase names for my variables to show that the names don't matter. Choose your own as you like. Similarly, then, you can make the following substitutions.

```
978 LOCATE xpos,ypos,what
```

can be written as

```
978 POSITION xpos,ypos: GET #6,what
```

or, by extension,

```
978 POKE 85,xpos: POKE 84,ypos: GET
    #6,what
```

The last one, for now, is just a bit more exotic:

```
330 DRAWTO xpos,ypos
```

is actually performed as if you had used

```
330 POSITION xpos,ypos
331 POKE 763,mycolor: XIO 17,#6,12,
    0,"S:"
```

or, in more detail,

```
330 POKE 85,xpos: POKE 84,ypos
331 POKE 763,mycolor: XIO 17,#6,12,
    0,"S:"
```

Why did I go to the trouble of breaking the BASIC statements above down into equivalent forms? Because these equivalent forms are much easier to translate into assembly language, and such translation is the main point of this article. For example, POKE and PEEK are the easiest BASIC statements to translate to assembly language. The reason? Much of assembly language consists of nothing more than fancy ways to do PEEKs and POKEs. In this short set of articles, I can't hope to teach you all the addressing modes of the 6502, so let me restrict myself to the simplest form.

For a first example, to emulate the BASIC statement

```
POKE 85,xpos
```

in 6502 assembly language, we need only code

```
LDA   xpos
STA   85
```

which can be read as "LoaD the A register with the contents of *xpos* and then STore the contents of the A

register into location 85." That sounds simple enough, but the thing that makes the 6502 one of the more difficult CPU's to program for is the fact that the A register can hold, *at most*, one byte of information.

You don't see why that is a problem? Well, suppose we are doing work with GRAPHICS 8 or 24, where the horizontal (*x*) position can range from 0 to 319. A single byte can hold only values in the range 0–255. Oops. Ah, well, the analogy with Atari BASIC isn't so bad here, because the POKE command has the same restriction. It, too, can only affect a single byte. By extension, then: How do you change more than byte when using POKEs in BASIC? By using more than one POKE, right? So, in assembly language, you must use more than one STA instruction.

But if I even *hope* to be able to finish this set of articles, I will have to cut off this introduction to 6502 assembly language at this point. If you did not understand *any* of this article, I would suggest you learn more about BASIC before trying assembly language. If you are a good BASIC programmer and this left you looking for more, then I suggest that you look into some of the books I recommended in my July column. ©

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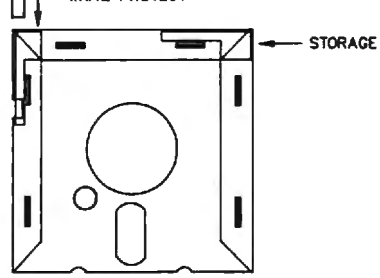

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64 Eighty

Jeffrey Partch

Now Commodore 64 owners can enjoy the benefits of an 80-column screen display without buying expensive hardware add-ons. Through clever programming, "64 Eighty" gives you an 80-column display with normal color output, simultaneous access to any of the 64's character sets, underlining, boldface, and an enhanced screen editor that supports many of the special editing functions of the Commodore 128.

If you own a Commodore 64, or you use a Commodore 128 in 64 mode, you may have wished for a way to display an 80-column screen. Eighty-column displays are very useful because they allow you to fit a lot of text on the screen at one time. "64 Eighty" lets you add an 80-column capability to your 64 without sacrificing the other features which make the 64's editor so powerful.

The 64 Eighty program works in the background: Once it is installed, the usual editing functions, such as cursor keys, work as they do normally. However, now each line is 80, instead of 40, characters wide. In addition, you can have more than one character set on the screen at one time. And 64 Eighty also implements many of the special editing functions available on the Commodore 128.

Because 64 Eighty uses high-resolution graphics to create the 80-column display, it is recommended that you use it only if you have a composite video monitor. The smaller 80-column characters may not be very readable if you use the program with a TV set.

Typing It In

64 Eighty is written in machine language, so you'll need to use the "MLX" machine language entry program to type it in. MLX is printed elsewhere in this issue. Please read all of the instructions before you type in the program. When you run MLX, you will be asked for a starting address and an ending address for the data you'll be entering. For 64 Eighty, use the following values:

Starting Address: 0801
Ending Address: 1890

64 Eighty is designed to load and run exactly like a BASIC program. Load it as you would any BASIC program; then type RUN and press RETURN. 64 Eighty switches the display to 80-column mode and displays a short startup message. The READY prompt indicates that the BASIC screen editor is ready for use.

To turn off 64 Eighty and return to 40-column mode, type SYS 64738 and press RETURN. Note that this SYS resets the computer and does a NEW of any BASIC program in memory. Be sure to save any program that you wish to preserve *before* you perform this SYS.

The 64 Eighty Environment

Once the 80-column screen is active, you can use the screen editor normally. The RETURN key enters a line, the cursor keys move the flashing cursor, and so on. You also can change screen colors in the normal way. 64 Eighty always begins with blue letters on a black screen background, but this is easy to change. For instance, run 64 Eighty and type this line in direct mode (without a line number):

```
POKE 646,0: POKE 53280,15: POKE
  53281,15
```

You should see black letters on a light gray screen. The POKE to location 646 changes the current text color. You also can change this color by pressing CTRL and a number key as usual. As in 40-column mode, pressing RUN/STOP–RESTORE resets the screen and text colors to their original values.

You may wish to customize the program to display different screen colors when it starts and when you press RUN/STOP–RESTORE. To change the default screen colors, follow these steps exactly.

1. Load 64 Eighty into memory. Do *not* run the program.
2. Write down the color numbers for the background color, border color, and text colors you wish to use. Your owner's manual has a list of the 16 color numbers; the color number for black is zero, and so forth.
3. Type the following statements in direct mode (without line numbers), replacing BO, BG, and TX with the desired border, background, and text color numbers, respectively:

```
POKE 3425, BO
POKE 3426, BG
POKE 3860, TX
```

For example, if you wish to set the border and background to white (color 1), and the text color to black (color 0), you would type these lines, pressing RETURN at the end of each line:

```
POKE 3425, 1
POKE 3426, 1
POKE 3860, 0
```

4. After you type the POKEs, resave the program using a name different from the one you used when saving it from MLX. *Do not run the program before you resave it.* 64 Eighty performs a NEW after installing itself in memory, so if you run the program before saving the modified version, your work will be lost.

For the most part, the 64 Eighty editor functions just like the familiar 40-column editor. Note, however, that while the 40-column editor restricts the length of a logical line to 80 characters, the 64 Eighty editor imposes no limit other than screen size. BASIC's input routine allows as many as 88 characters in a line, so you can enter BASIC program lines containing up to 88 characters.

New Editing Functions

This program offers a number of special screen editing functions similar to those on the Commodore 128. Since the 64's keyboard has no key labeled ESC (ESCape), this program interprets the left-arrow key at the upper left corner of the keyboard as ESC. If you are using a Commodore 128 in 64 mode, you must use this key with 64 Eighty rather than the 128's ESC key, which is ignored in 64 mode. If you need to type the normal left-arrow symbol, press the left-arrow key twice in succession.

To invoke an ESC-key feature, press the left-arrow key once; then release it and press the key indicated in Table 1. For instance, to change the cursor from a flashing block shape to a flashing underline, press the left-arrow key followed by the U key.

Although the ESC functions are designed primarily for direct mode, they also can be invoked in program mode with this syntax:

```
PRINT CHR$(27);code$
```

Replace *code$* in this example with the letter for the function you want to use. For example, to change the cursor to an underline, you would execute PRINT CHR$(27); "U" or PRINT CHR$(27);CHR$(85).

Table 1: ESCape Functions

ESC A	Enable autoinsert mode
ESC C	Disable autoinsert mode
ESC D	Delete physical line at cursor position
ESC I	Insert blank line at cursor position
ESC E	Turn off cursor flashing
ESC F	Set cursor to flashing mode
ESC @	Clear screen from cursor to bottom
ESC Q	Erase from cursor to end of logical line
ESC P	Erase from cursor to start of logical line
ESC G	Enable bell sound by CTRL-G
ESC H	Disable bell sound by CTRL-G
ESC J	Move cursor to start of logical line
ESC K	Move cursor to end of logical line
ESC L	Enable screen scrolling
ESC M	Disable screen scrolling
ESC O	Cancel quote, insert, underline, reverse, and boldface modes
ESC U	Cursor appears as an underline
ESC S	Cursor appears as character-size block
ESC B	Set bottom right corner of screen at cursor
ESC T	Set top left corner of screen at cursor
ESC V	Scroll screen window up
ESC W	Scroll screen window down

New Control Functions

64 Eighty also adds several functions which you invoke with the CTRL key. Table 2 lists all of these functions. To invoke a CTRL function, hold down CTRL and press the indicated key. For instance, to make a bell sound, hold down CTRL and press G.

Some of these functions can be invoked in program mode by printing a single CHR$ value. For example, the statement PRINT CHR$(7) makes a bell sound. Boldface characters are simply characters from the normal 40-column character set. On a screen containing 80-column characters, boldface characters stand out dramatically. Note that boldface characters are for cosmetic purposes only; when you press RETURN over a line of boldface characters, the 64 Eighty editor interprets them as spaces.

Table 2: CTRL Functions

ASCII value	Keys	Result
CHR$(2)	CTRL-B	Underline on
CHR$(7)	CTRL-G	Bell sound
CHR$(15)	CTRL-O	Boldface on
CHR$(27)	← or CTRL [	Send ESCape code
CHR$(130)	none	Underline off
CHR$(143)	none	Boldface off

64 Eighty Memory Organization

Although the 64 Eighty editor works much like the normal editor, it makes several changes to the computer's normal memory configuration. Like any other reconfiguration, these changes affect what you can do in 80-column mode—including what sort of programs you can run successfully. In the following explanations, all memory addresses refer to the computer's configuration *after* 64 Eighty has been installed.

Screen Memory. Screen memory is no longer in its normal location. The area where screen memory normally resides, locations 1024–2047, is used to hold a character set for 64 Eighty. Thus, any program that POKEs or PEEKs locations 1024–2047 will need to be modified before using it with 64 Eighty.

Within the area from 1024 to 2047, each eight-byte group stores the shape of one character. The upper four bits in each byte describe the uppercase/graphics version of that character, and the lower four bits hold the lowercase/uppercase version. Thus, each character is four dots wide and eight dots high. Only ASCII values 0–127 are defined. The reverse-video and underline effects are handled by the screen editor.

64 Eighty uses the 2000-byte area in locations 33729–35791 as its screen memory. Each byte in this zone contains the screen code for one character space on the 80-column screen. Values POKEd into this area are recognized by the screen editor, but have no effect on the display itself (you can't make a character appear by POKEing its screen code into this area).

The 48 bytes in locations 35792–35839 are used internally for line links and other miscellaneous data.

Color Memory. Locations 35840–36863 serve as color memory for 64 Eighty. Only the first 1000 bytes contain valid color information, but this range is also interpreted by the VIC-II chip as the video matrix, which must be 1024 bytes in length. Because color memory is limited to 1000 bytes, but screen memory contains 2000, each byte of data in this area affects the color of two adjacent characters on the screen.

The simplest way to change the text color is with the CTRL key combinations listed in your user's manual. As noted above, the border and background colors can be changed with POKEs to locations 53280–53281.

You also can change the color of characters by POKEing new values directly into this memory area. The upper four bits of each byte control the foreground color of a character, while the lower four bits control its background. Thus, you could use this area to simulate the extended background color mode available on the 40-column screen.

If you are looking for safe spaces to store sprite shapes or other data, note that locations 36840–36863 and 39912–40959 are not used by 64 Eighty for any purpose.

Display memory. Locations 40960–48959 contain the high-resolution bitmap that determines what you see on the screen. This image is normally a representation of the screen codes stored in screen memory (see above). To avoid sacrificing too much BASIC program space, this bitmapped image resides in the RAM underlying the 64's BASIC ROM chip—a zone that is not normally accessible with PEEK from BASIC. However, you might want to read the contents of this area to create graphics or fancy characters on the 64 Eighty screen. To make this possible, 64 Eighty includes a special machine language routine you can invoke with USR.

To use this feature, first execute the statements POKE 785,199 and POKE 786,155. Those POKEs tell USR where to find the machine language routine. Then invoke the routine with the statement X=USR (*address*), where *address* is the memory location you want to PEEK. After this statement executes, the variable X contains the value held in the specified byte.

Compatibility

Because 64 Eighty reconfigures the computer, there's no guarantee that it will work with any and every program you might want to run. The simplest way to test whether a particular program is compatibile is to install 64 Eighty, then load and run the program. If the computer doesn't lock up and the screen looks as expected, you're probably in business. If it doesn't work, you must either modify the program or abandon the idea. (No harm is done if the computer crashes; simply turn the power off and on to regain control.)

Some programs, of course, can't possibly be made to work while 64 Eighty is active. This includes all high-resolution graphics programs and many machine language programs, such as COMPUTE!'s popular *SpeedScript* word processor, which take you out of the BASIC environment completely. 64 Eighty is a modification to the BASIC screen editor; if a program doesn't use that environment, it cannot be expected to work with 64 Eighty.

Of course, any program that POKEs or otherwise corrupts the memory used by 64 Eighty itself will probably crash the system.

64 Eighty

Please refer to the "MLX" article in this issue before entering the following program.

```
0801:19 08 00 00 9E 32 30 37 F4
0809:36 3A A2 3A 8F 22 14 14 FB
0811:14 14 14 14 14 14 14 00 0D
0819:00 00 00 A0 00 A9 56 85 0C
0821:03 A9 08 85 04 A9 B0 85 24
0829:05 A9 8B 85 06 A9 8E 85 69
0831:FB A9 18 85 FC A5 03 E5 6F
0839:FB A5 04 E5 FC B0 13 B1 12
0841:03 91 05 E6 03 D0 02 E6 8C
0849:04 E6 05 D0 02 E6 06 4C C6
0851:36 08 4C B0 8B 78 A2 00 96
0859:A0 84 8C 8A 02 8E 20 D0 70
0861:8E 21 D0 8E 11 D0 86 37 14
0869:84 38 86 33 84 34 20 2D 30
0871:FE A0 00 B9 00 8C 99 00 2A
0879:04 C8 D0 F7 EE D0 8B EE 18
0881:D3 8B AC D3 8B C0 08 D0 71
0889:E8 20 33 A5 A4 23 A5 22 F5
0891:18 69 02 90 01 C8 85 2D B4
0899:84 2E 85 2F 84 30 85 31 3C
08A1:84 32 4C 60 91 00 33 55 58
08A9:55 44 44 33 00 00 20 56 C7
08B1:51 73 55 57 00 00 64 54 84
08B9:66 55 55 67 00 00 20 53 07
08C1:44 44 54 23 00 00 61 51 D5
08C9:53 55 55 67 00 00 70 42 1D
08D1:65 47 44 73 00 00 72 44 4F
08D9:66 44 44 44 00 00 20 53 8E
08E1:45 53 51 31 02 00 54 54 B3
08E9:76 55 55 55 00 00 72 20 8F
08F1:26 22 22 77 00 00 12 10 8D
08F9:16 12 52 22 04 00 54 65 34
0901:46 46 65 55 00 00 46 42 98
0909:42 42 42 77 00 00 50 75 A2
0911:57 55 55 55 00 00 50 76 3B
0919:75 75 55 55 00 00 20 52 D5
0921:55 55 55 22 00 00 60 56 17
0929:65 46 44 44 04 00 20 53 FF
0931:55 53 71 71 01 00 60 56 27
0939:65 54 54 54 00 00 20 53 76
0941:44 22 11 66 00 00 72 22 8D
0949:27 22 22 21 00 00 50 55 C3
0951:55 55 55 33 00 00 50 55 37
0959:55 55 55 22 00 00 50 55 2E
0961:55 55 77 55 00 00 50 55 AD
0969:22 22 52 55 00 00 50 55 AA
0971:55 25 23 21 02 00 70 17 F5
0979:21 42 44 77 00 00 66 44 BD
0981:44 44 44 66 00 00 22 55 4F
0989:44 66 44 77 00 00 33 11 CE
0991:11 11 11 33 00 00 22 77 81
0999:22 22 22 22 00 00 00 00 AB
09A1:44 FF 44 00 00 00 00 00 5E
09A9:00 00 00 00 00 00 22 22 22
09B1:22 22 00 22 00 00 55 55 7F
09B9:00 00 00 00 00 00 55 77 ED
09C1:55 77 55 55 00 22 22 77 A0
09C9:66 11 77 22 00 00 55 11 20
09D1:22 22 44 55 00 00 22 55 F4
09D9:66 EE 99 77 00 00 11 22 C9
09E1:00 00 00 00 00 00 22 44 7C
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12F1:19 B1 F1 25 DA 24 DA 30 EC
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1321:97 20 9E 92 68 20 FD 95 6D
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1331:00 85 E1 20 2B 9B 68 85 15
1339:E1 A9 00 85 CF F0 19 A5 2D
1341:DF F0 15 A0 07 A5 D3 29 DF
1349:01 F0 03 A9 0F 2C A9 F0 94
1351:85 DA B1 EF 45 DA 91 EF CE
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1359:A4 D3 A6 D6 BD D1 8B 29 7E
1361:BF 9D D1 8B 20 D9 96 A9 01
1369:00 85 D9 A5 D8 F0 02 C6 DB
1371:D8 4C 87 95 A6 E4 A4 E6 5A
1379:86 D6 84 D3 38 60 C4 E6 1A
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16B9:D6 60 86 D6 E4 E4 F0 20 64
16C1:8A 09 80 8D D0 8B 20 A7 FA
16C9:9A E4 E4 D0 F9 AD D0 8B D9
16D1:29 7F AA E8 BD D1 8B CA 6D
16D9:9D D1 8B E8 E4 E4 D0 F3 99
16E1:A5 E5 85 D3 4C D5 92 A5 CC
16E9:D6 48 A5 D3 A6 E3 20 00 8A
16F1:9A 68 85 D6 60 A6 E4 E4 EF
16F9:E3 F0 E5 86 D6 20 A7 9A 9A
1701:EC D0 8B D0 F8 A6 E4 CA 4F
1709:BD D1 8B E8 9D D1 8B CA A0
1711:EC D0 8B D0 F2 F0 C9 A6 FD
1719:D6 BD D1 8B 09 40 48 E4 D3
1721:E4 F0 0A 8E D0 8B 8A 48 3A
1729:20 50 9A 68 AA 86 D6 20 92
1731:D5 92 68 9D D1 8B 60 A5 F8
1739:D6 48 A5 D3 48 A5 E3 8D 05
1741:D0 8B 20 50 9A 68 85 D3 19
1749:68 85 D6 60 A5 E6 85 D5 97
1751:85 D3 A6 D6 20 A0 92 A5 C7
1759:F1 48 A5 F2 48 A5 F3 85 BC
1761:EA A5 F4 85 EB A5 D1 85 84
1769:EC A5 D2 85 ED 2C D0 8B 77
1771:30 02 CA CA E8 86 D6 20 6D
1779:A0 92 68 85 F2 68 85 F1 38
1781:A5 E6 38 E5 E5 4A AA A4 F3
1789:D5 B1 D1 91 EC 88 B1 D1 21
1791:91 EC 84 D5 A0 07 B1 EF 26
1799:91 F1 88 10 F9 A5 EF 38 9D
17A1:E9 08 85 EF B0 02 C6 F0 82
17A9:20 9C 95 A5 D5 C6 D5 4A DB
17B1:A8 B1 F3 91 EA CA 10 CF AA
17B9:A6 D6 18 60 C6 DC D0 50 95
17C1:C6 CD D0 4C A9 16 85 CD 24
17C9:A5 E1 10 04 24 CF 30 40 86
17D1:A5 01 48 29 FE 85 01 A5 64
17D9:D3 A8 29 01 F0 04 88 A9 A3
17E1:0F 2C A9 F0 8D 5A 9B B1 A5
17E9:D1 C9 20 D0 0A C8 B1 D1 2D
17F1:C9 20 D0 03 20 0D 93 A5 59
17F9:E1 29 7F A8 B1 EF 49 F0 AE
1801:91 EF C8 C0 08 D0 F5 A5 30
1809:CF 49 FF 85 CF 68 85 01 F7
1811:18 60 A2 18 A9 80 9D D1 97
1819:8B CA 10 FA 60 A9 00 85 A2
1821:DF 60 A9 00 85 C7 60 A9 44
1829:00 85 DE 60 24 E2 30 1A C3
1831:A0 20 A2 09 A9 17 8E 05 6A
1839:D4 8E 06 D4 8D 18 D4 0A 06
1841:8D 01 D4 8C 04 D4 C8 8C 6D
1849:04 D4 60 98 88 C5 E5 D0 3E
1851:0A A4 E6 A6 D6 E4 E3 F0 F9
1859:04 C6 D6 84 D3 60 98 C8 7A
1861:C5 E6 D0 05 20 EF 99 A4 31
1869:E5 84 D3 60 A5 14 48 A5 E1
1871:15 48 20 F7 B7 A5 01 48 60
1879:29 FE 85 01 A0 00 B1 14 3B
1881:A8 68 85 01 68 85 15 68 CC
1889:85 14 4C A2 B3 00 00 00 D2
```

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BASIC Batch Files With Atari DOS

Bill Bodenstein

Now any Atari BASIC programmer can write batch files to configure the computer, run programs, or execute any BASIC command automatically when you power up. For the Atari 400, 800, XL, and XE.

Every computer user has his or her favorite computer setup. When Atari wrote the operating system for their eight-bit computers, they decided that a default screen of 38 characters per line with a light blue background would be most popular among Atari users. But what if you prefer a black background or a 40-column screen? With a disk drive and Atari DOS, you need only make an AUTORUN.SYS file to change the screen settings at power-up. But what if you don't know machine language or even know how to create a binary file? Constructing an AUTORUN.SYS file, even one that simply changes the screen color to black, can be tricky, especially for beginning computerists. This program provides an easy way to make your computer execute any series of BASIC commands when you flip on the power switch.

To begin, type in and save the program included with this article. With the aid of this program, you can create a special AUTORUN .SYS file that executes any BASIC commands which you want to perform at boot-up time.

Let's start with a simple example. Say that you want to change the screen color to black when you turn on the computer. Run the program, inserting a disk in the drive when prompted. When the program prompts you to enter a BASIC statement, type this line and press RETURN:

```
POKE 710,0
```

When that's done, press RETURN without typing anything. The program writes the statement to disk and closes the disk file. To test the AUTORUN.SYS file, simply reboot the computer. If you didn't make any typing mistakes, the screen color should automatically turn black. To correct a typing error or enter a new statement, simply rerun the program.

The same method can be used to execute any BASIC statements that would be legal in direct mode. The special AUTORUN.SYS file can reconfigure the computer in any way, or even load and run programs. For instance, say that you want to automatically load and run a BASIC program named GAME-.BAS when the system boots. Instead of the POKE statement shown above, you can type this command when prompted by the program:

```
RUN "D:GAME.BAS"
```

When this AUTORUN.SYS file is on the disk, the computer automatically searches for GAME.BAS when you boot up, loading and running it just as if you had typed the command from the keyboard.

Batch Files

This program allows you to use batch files, a feature common to many computers. A batch file is a text file containing a batch, or collection, of commands which the computer executes automatically. Batch files are an integral part of systems like MS-DOS/PC-DOS or AmigaDOS, but Atari DOS makes no provision for them. However, Atari DOS does include a feature known as the AUTORUN.SYS file, a machine language file which, if present, is executed automatically when the system boots.

The program accompanying this article simply creates an AUTORUN.SYS program that emulates the batch processor found in other systems. The BASIC statements that you type when running this program are written to a text file called AUTORUN.BAT. The AUTORUN.SYS file reads the commands from AUTORUN.BAT, executing whatever it finds there.

That process may sound more complex than it is in fact. All we need is a few machine language instructions to perform the effect of the following statement:

```
ENTER "D:AUTORUN.BAT"
```

The key to this technique is the ENTER command. Under normal circumstances, you enter BASIC program lines and direct-mode commands into memory with the screen editor device (E:). The screen editor lets you type commands on the keyboard, displaying them on the screen as you type. When you press RETURN, the editor reads the current line from the screen and performs it. If the line starts with a number, it is stored in BASIC memory; otherwise, it is performed as a direct-mode command.

ENTER lets you tell the computer to get its input from some device other than the screen editor. The most common use of this command is to ENTER a program from cassette (device C:) or disk (device

D:). When you ENTER a program from disk, the computer reads the indicated text file from disk and stores it in memory with the same result as if you were typing each line into memory by hand. The end product is exactly the same—the computer sees only the input data, without caring where it comes from.

The same technique can be used to enter direct-mode statements into memory. Type and run the following program to create a text file named DOSTUFF:

```
10 OPEN #1,8,0,"D:DOSTUFF
   "
20 PRINT #1;"POKE 710,0"
30 PRINT #1;"POKE 82,0"
40 CLOSE #1
```

Line 10 of this program opens the file DOSTUFF for output. Lines 20–30 write two POKE statements into that file. Line 40 closes the file. At this point we have a test file on disk containing two direct-mode commands: POKE 710,0 and POKE 82,0. To make the computer execute this file, type this line in direct mode and press RETURN:

```
ENTER "D:DOSTUFF"
```

The computer changes the background color to black and moves the left margin over two columns, just as if you had typed the two POKEs on the keyboard.

Thus, ENTER allows you to change BASIC's input device. The command ENTER "D:*filename*" makes the disk drive the input device. The computer reads and executes instructions from the disk file until it reaches the end of the file, at which point it automatically receives input from the screen editor again.

The machine language part of this program redirects input to a disk file by means of the IOCB (Input/Output Control Block). It performs the equivalent of these two BASIC lines:

```
OPEN #7,4,0,"D:AUTORUN.BAT"
POKE 180,7
```

Location 180 ordinarily contains a zero, referring the IOCB 0, which the operating system reserves for the screen editor. Replacing the zero with a 7 fools the system into using the previously opened channel (7) for input rather than the editor. Each time a READY prompt appears and BASIC looks for input, it extracts and performs a line from the batch file instead.

BASIC Batch Files

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
AK 5 REM Copyright 1987 Comp
     ute! Publications, Inc.
BC 6 REM All Rights Reserved
     .
IB 7 PRINT "{CLEAR}
     {5 SPACES}Copyright 198
     7":PRINT "Compute! Publ
     ications, Inc."
AB 8 PRINT "{3 SPACES}All Ri
     ghts Reserved."
ED 10 FOR X=1 TO 1000:NEXT X
LC 20 DIM A$(1),LINE$(120):O
     PEN #2,12,0,"E:":POKE
     82,0:? "{TAB}{BASIC BAT
     CH FILE MAKER}":?
JC 30 ? "This program will a
     llow you to create":?
     "an AUTORUN.SYS & AUTO
     RUN.BAT file that"
MN 40 ? "will execute a seri
     es of BASIC commands":
     ? "whenever you turn y
     our system on."
LP 50 ? :? "Insert a diskett
     e and HIT <RETURN> to"
     :? "create the AUTORUN
     .SYS file.";
PN 60 INPUT A$:TRAP 100:OPEN
      #1,4,0,"D:AUTORUN.SYS
     ":GOTO 80
CA 80 CLOSE #1:? "AUTORUN.SY
     S ALREADY EXISTS!":? "
     Would you like to over
     write it (Y/N)";
CP 85 INPUT A$:IF A$="Y" THE
     N 150
AA 90 IF A$<>"N" THEN 80
AM 95 GOTO 50
AK 100 IF PEEK(195)<>170 THE
     N 400
DA 150 ? "Creating AUTORUN.S
     YS...":TRAP 400
II 160 CLOSE #1:OPEN #1,8,0,
     "D:AUTORUN.SYS":RESTO
     RE
LG 170 READ N:IF N>-1 THEN P
     UT #1,N:GOTO 170
BO 200 CLOSE #1:OPEN #1,8,0,
     "D:AUTORUN.BAT":? :?
     :? "AUTORUN.BAT ready
      for input...":?
FN 210 ? "Now enter any stat
     ements/commands you'd
     ":? "like executed at
      start-up."
GN 220 ? "(Enter just a <RET
     URN> when done.)"
BN 250 POKE 694,0:POKE 702,6
     4:? "ENTER A LINE:";I
     NPUT #2;LINE$:PRINT #
     1;LINE$:IF LINE$<>""
     THEN 250
EK 260 CLOSE #1:CLOSE #2:? :
     ? "BATCH file created
     !":? "Boot disk to tr
     y it out.":END
CE 400 ? "{BELL}{ERROR - ";PE
     EK(195):CLOSE #1:CLOS
     E #2:STOP
PK 500 DATA 255,255,0,6,219,
     6,169,1,133,9,169,0,1
     41,68,2,169
KB 510 DATA 130,32,109,6,165
     ,106,201,161,176,7,17
     3,96,160,201,165,240
LJ 520 DATA 5,169,156,76,109
     ,6,173,70,3,133,204,1
     73,71,3,133,205
BJ 530 DATA 169,54,141,70,3,
     169,6,141,71,3,108,25
     0,191,165,204,141
LJ 540 DATA 70,3,165,205,141
     ,71,3,162,112,169,3,1
     57,66,3,169,206
BJ 550 DATA 157,68,3,169,6,1
     57,69,3,169,4,157,74,
     3,32,86,228
FN 560 DATA 16,10,192,170,20
     8,212,169,184,32,109,
     6,96,169,7,133,180
BD 570 DATA 76,96,160,162,0,
     157,68,3,169,6,157,69
     ,3,157,73,3
DC 580 DATA 169,9,157,66,3,7
     6,86,228,125,80,114,1
     11,99,101,115,115
HK 590 DATA 105,110,103,32,9
     8,97,116,99,104,32,10
     2,105,108,101,46,46
MM 600 DATA 46,155,78,101,10
     1,100,32,66,65,83,73,
     67,32,40,114,101
JG 610 DATA 118,46,32,65,44,
     66,44,111,114,32,67,4
     1,46,155,66,97
OE 620 DATA 116,99,104,32,10
     2,105,108,101,32,110,
     111,116,32,102,111,11
     7
IF 630 DATA 110,100,46,155,6
     8,58,65,85,84,79,82,8
     5,78,46,66,65
ME 640 DATA 84,155,224,2,225
     ,2,0,6,-1
```

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Math Graphics For Atari ST

Len Cortigiano

Colorful lines swirl about the screen in these two graphics demos. The shapes will fascinate children of all ages. And if you're a BASIC programmer, you'll learn how the technique of color cycling works. For all STs with a color monitor (low resolution only).

For as long as I've been using computers, I have been fascinated by their graphics capabilities. When I read the article "Amiga Math Graphics" (which itself was a modification of an Apple II graphics program) in the October 1986 issue of COMPUTE!, I wanted to see it run on my Atari ST.

"Math Graphics" uses the trigonometric sine and cosine functions to draw colorful, symmetrical shapes. Translating the program from Amiga BASIC to ST BASIC was fairly easy. A useful feature of both BASICs is the ability to GOSUB to named subroutines. For example, GOSUB INITIALIZE is easier to remember than a line number, and it has more significance. The ST program requires some VDISYS and GEMSYS commands, two powerful features of ST BASIC, to include a simple animation routine in the second demo program.

Both programs run in the 16-color low-resolution mode to make them as colorful as possible, and also because all 16 color palettes are needed for the color cycling which produces the animation. If your ST isn't already set for low-resolution mode, use the Preferences menu option to switch to low res before you activate ST BASIC.

Important: If you're using an older 520ST, which requires you to load the TOS operating system from disk, be sure to turn off ST BASIC's buffered-graphics option to free up enough memory for these programs. (To turn off buffered graphics, drop down the Run menu in ST BASIC and click once on the Buf Graphics item.) If your computer has TOS in ROM (as do all STs manufactured after 1985), this step isn't necessary.

How It Works

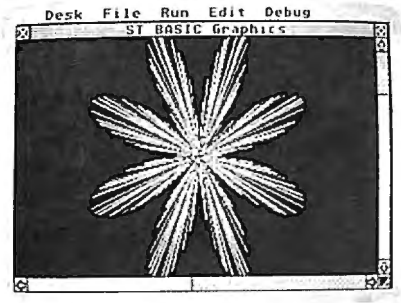
The key to both programs is the LINEF command, which draws a line between two points. The trick is figuring out a series of endpoints which result in an interesting graphics effect.

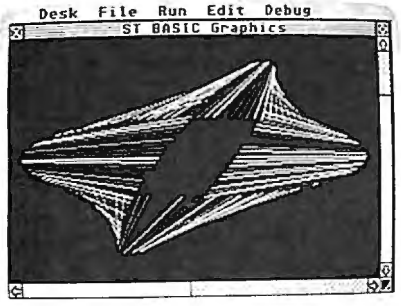
The locations of the lines are calculated using polar coordinates. You may be familiar with the Cartesian system, which describes a point in terms of an x coordinate (the horizontal distance from the origin point) and a y coordinate (the vertical distance). In the polar system, a point has a distance from the origin point (variable R in the program) and an angle (variable Theta). For the purposes of this program, polar coordinates are easier to handle.

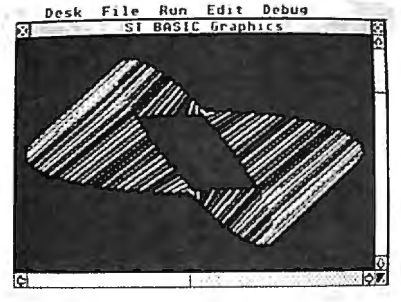
Both programs start by checking whether the computer is set for low resolution by PEEKing memory location SYSTAB, an ST BASIC reserved variable. If the computer is in medium-res or hi-res mode, an alert box opens on the screen and prompts you to switch resolutions. Click on the OK button and use Set Preferences from the Options menu on the GEM desktop to enter the low-resolution mode (note that this requires a color monitor).

Once the programs are sure the ST is in low-resolution mode, they go to MATHGRAPHICS, the main loop label for both programs. Here, the RECORD subroutine is called to store the original color palette in the array OLD%. This is done so that the original values can be restored when the program is finished.

Next, INITIALIZE is called, and it, in turn, branches to three other subroutines: TITLEBAR, to place a custom title on the output window; HIDEMOUSE, to disable the mouse pointer so it can't spoil the pictures; and WIPE, which uses a VDI routine to paint the screen black much faster than BASIC's FILL command can.







"Math Graphics For Atari ST" uses trigonometric functions to produce a variety of aesthetically pleasing patterns. Low-resolution is used to achieve 16 different colors. The top screen photo was produced by Program 1 and the lower two were produced by Program 2.

Next, the random generator is seeded with a zero to insure a different sequence of colors each time the program is run (Program 1 only).

Finally, the values of constants Pi and TwoPi are set, and DEF FN is used to set up the polar-to-Cartesian functions. The program uses polar coordinates, but the ST's screen is laid out in a standard *x,y* grid. The FNPolarX and FNPolarY functions do the translating.

Color Cycling

In Program 1, the main loop cycles through eight modules, each one producing a different shape. Before each line is drawn, a different color is selected at random from the ST's current palette. For more variety, you might want to try adding a subroutine at the beginning of the program to select a new palette at random from the 512 colors available on the ST. PAUSE holds the image on the screen for a few moments, and WIPE is called again to quickly erase the picture before the next one is drawn.

Program 2 goes through the same eight modules and draws the same shapes, but selects colors from the palette in sequential order from 2 to 15. Colors 0 (white) and 1 (black) are not used, since using white would cause the window borders to change colors during the animation and using black would cause the background to change color.

After each shape is drawn, the ANIMATE subroutine takes over, changing all the available colors to black using the BLACKOUT subroutine. The picture seems to disappear. One by one, individual lines are "turned on" with cyan, and "turned off" with black, by alternately calling the BLUES and BLACKOUT subroutines while stepping through the 14 color palettes. Duration is set by the value of the variable Cycle, using a WHILE-WEND loop to count down to zero. At zero, the subroutine PLAYBACK is called to restore the original color palette before going on to the next shape.

In both programs, after all eight shapes have been drawn, the screen is cleared and a dialog box is opened. Click on the RE-RUN button to run the program again or on the QUIT button to abort. Quitting the program clears and then closes the output window before the program ends.

For instructions on entering these programs, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

Program 1: MGRAF1.BAS

```
10    'Copyright 1987 COMPUTE!
      Publications, Inc.
20    'All Rights Reserved
70    dim Old%(16,3):'array for
       color values
80    if peek(systab)=4 then go
      to MathGraphics
90    goto MEDIUMRES
100   MathGraphics:
110   gosub COPYRIGHT
120   gosub RECORD
130   gosub INITIALIZE
140   'Module 1:RightOvals--
150   R1=140
160   R2=20
170   R3=25
180   R4=65
190   Inc=Pi/64
200   for Theta=0 to 2*TwoPi st
      ep Inc
210   LC=int(14*rnd)+2:'random
      numbers between 2 and 15
      for line colors
220   color 1,1,LC
230   X1=FNPolarX(R1,Theta)
240   Y1=FNPolarY(R2,Theta)
250   X2=FNPolarX(R3,Theta+Pi)
260   Y2=FNPolarY(R4,Theta+Pi)
270   linef X2,Y2,X1,Y1
280   next
290   gosub PAUSE:gosub WIPE
300   'Module 2:SideOvals--
310   R1=140
320   R2=28
330   R3=65
340   R4=65
350   Inc=Pi/64
360   Offset=Pi/3
370   for Theta=0 to 3*TwoPi st
      ep Inc
380   LC=int(14*rnd)+2:color 1,
      1,LC
390   X1=FNPolarX(R1,Theta)
400   Y1=FNPolarY(R2,Theta)
410   X2=FNPolarX(R3,Theta+Offs
      et)
420   Y2=FNPolarY(R4,Theta)
430   linef X1,Y1,X2,Y2
440   next
450   gosub PAUSE:gosub WIPE
460   'Module 3:TwistedBand--
470   R1=140
480   R2=28
490   R3=65
500   R4=65
510   Inc=Pi/64
520   Offset=Pi/3
530   for Theta=0 to 3*TwoPi st
      ep Inc
540   LC=int(14*rnd)+2:color 1,
      1,LC
550   X1=FNPolarX(R1,Theta)
560   Y1=FNPolarY(R2,Theta)
570   X2=FNPolarX(R3,Theta)
580   Y2=FNPolarY(R4,Theta+Offs
      et)
590   linef X1,Y1,X2,Y2
600   next
610   gosub PAUSE:gosub WIPE
620   'Module 4:MultiLobe--
630   R1=95
640   Inc=Pi/128
650   Lobes=4
660   for Theta=0 to 2*TwoPi st
      ep Inc
670   LC=int(14*rnd)+2:color 1,
      1,LC
680   R2=R1*sin(Lobes*Theta)
690   X1=FNPolarX(R2,Theta)
700   Y1=FNPolarY(R2,Theta)
710   linef XCenter,YCenter,X1,
      Y1
720   next
730   gosub PAUSE:gosub WIPE
740   'Module 5:SpiralCone--
750   R1=95
760   R2=68
770   Inc=Pi/160
780   Lobes=3
790   for Theta=0 to 2*TwoPi st
      ep Inc
800   LC=int(14*rnd)+2:color 1,
      1,LC
```

```
810   X1=FNPolarX(R1,Theta*Lobe
      s)
820   Y1=FNPolarY(R2,Theta)
830   linef XCenter,YCenter,X1,
      Y1
840   next
850   gosub PAUSE:gosub WIPE
860   'Module 6:SideSpiralCone-
      -
870   R1=121
880   R2=64
890   Inc=Pi/160
900   lobes=3
910   for Theta=0 to 2*TwoPi st
      ep Inc
920   LC=int(14*rnd)+2:color 1,
      1,LC
930   X1=FNPolarX(R1,Theta)
940   Y1=FNPolarY(R2,Theta*lobe
      s)
950   linef XCenter,YCenter,X1,
      Y1
960   next
970   gosub PAUSE:gosub WIPE
980   'Module 7:Circles--
990   R1=107
1000  R2=68
1010  R3=40
1020  R4=34
1030  Inc1=Pi/3
1040  Inc2=Pi/20
1050  for Theta=0 to TwoPi step
       Inc1
1060  LC=int(14*rnd)+2:color 1,
      1,LC
1070  for Theta2=0 to TwoPi ste
      p Inc2
1080  LC=int(14*rnd)+2:color 1,
      1,LC
1090  X1=FNPolarX(R1,Theta2)
1100  Y1=FNPolarY(R2,Theta2)
1110  X2=FNPolarX(R3,Theta)
1120  Y2=FNPolarY(R4,Theta)
1130  linef X1,Y1,X2,Y2
1140  next
1150  next
1160  gosub PAUSE:gosub WIPE
1170  'Module 8:Spikes--
1180  R1=107
1190  R2=68
1200  R3=40
1210  R4=34
1220  Inc1=Pi/3
1230  Inc2=Pi/18
1240  for Theta=0 to TwoPi step
       Inc1
1250  LC=int(14*rnd)+2:color 1,
      1,LC
1260  for Theta2=0 to TwoPi ste
      p Inc2
1270  LC=int(14*rnd)+2:color 1,
      1,LC
1280  X1=FNPolarX(R1,Theta2)
1290  Y1=FNPolarY(R2,theta)
1300  X2=FNPolarX(R3,Theta)
1310  Y2=FNPolarY(R4,Theta2)
1320  linef X1,Y1,X2,Y2
1330  next
1340  next
1350  gosub PAUSE:gosub WIPE
1360  FINISHED:
1370  'clean up and end the pro
      gram
1380  A#=GB:gintin=peek(A#+8):g
      intout=peek(A#+12):addrin
      =peek(A#+16)
1390  Text$="[0][!MathGraphics
      for ST    !]
1400  Text$=Text$+"[ Re-run | Q
      uit ]":gosub ALERT
1410  if Key=2 then gosub PLAYB
      ACK:clearw 2:closew 2:end

1420  goto MathGraphics
1430  INITIALIZE:
1440  'run this program in the
      low-res mode
1450  title$="ST BASIC Graphics
      "
1460  gosub TITLEBAR:gosub HIDE
      MOUSE
1470  openw 2:fullw 2:clearw 2
1480  gosub WIPE
1490  randomize(0):'keep the co
      lor sequence random
1500  'define constants
1510  Pi=3.14159
1520  TwoPi=2*Pi
1530  XCenter=151
1540  YCenter=83
1550  'define polar to Cartesia
      n conversion functions
1560  DEF FNPolarX(R,Theta)=r*c
      os(Theta)+XCenter
1570  DEF FNPolarY(R,Theta)=r*s
      in(Theta)+YCenter
1580  return
1590  PAUSE:
1600  for delay=1 to 5000:next
1610  return
1620  TITLEBAR:
1630  a#=gb:gintin=peek(a#+8)
1640  poke gintin+0,peek(systab
      +8):poke gintin+2,2
1650  s#=gintin+4:title$=title$
      +chr$(0)
1660  poke s#,varptr(title$):ge
      msys(105)
1670  return
1680  MEDIUMRES:
1690  'prompt user to switch to
       low-res
1700  A#=GB:gintin=peek(A#+8):g
      intout=peek(A#+12):addrin
      =peek(A#+16)
1710  Text$="[3][!MathGraphics
      for ST is designed!   to
      run in Low Resolution][ O
      .K. ]"
1720  gosub ALERT:end
1730  ALERT:
1740  'put message into alertbo
      x and display on screen
1750  gosub SHOWMOUSE
1760  N#=addrin:poke gintin,0
1770  Text$=Text$+chr$(0)+chr$(
      0)
1780  poke N#,varptr(Text$)
1790  gemsys(52)
1800  Key=peek(gintout)
1810  return
1820  WIPE:
1830  'quickly paint the screen
       black
1840  color 1,1:poke contrl,114
      :poke contrl+2,2:poke con
      trl+6,0
1850  poke ptsin,1:poke ptsin+2
      ,22:poke ptsin+4,304
1860  poke ptsin+6,188:vdisys(0
      )
1870  return
1880  RECORD:
1890  'peek old color values an
      d store in array
1900  for Kolor=0 to 15
1910  poke contrl,26:poke contr
      l+2,0:poke contrl+6,2
1920  poke intin,Kolor:poke int
      in+2,0:vdisys(0)
1930  Old%(Kolor,0)=peek(intout
      +2)
1940  Old%(Kolor,1)=peek(intout
      +4)
1950  Old%(Kolor,2)=peek(intout
      +6)
1960  next Kolor
1970  return
1980  PLAYBACK:
1990  'put old color values bac
      k
2000  for Kolor=0 to 15
2010  poke contrl,14:poke contr
      l+2,0:poke contrl+6,4:pok
      e intin,Kolor
2020  poke intin+2,Old%(Kolor,0
      )
2030  poke intin+4,Old%(Kolor,1
      )
2040  poke intin+6,Old%(Kolor,2
      )
2050  vdisys(0)
2060  next Kolor
2070  return
2080  HIDEMOUSE:
2090  'hide the mouse pointer
2100  poke contrl,123:poke cont
      rl+2,0
2110  poke contrl+6,0:vdisys(0)

2120  return
2130  SHOWMOUSE:
2140  'bring the mouse pointer
      back
2150  poke contrl,122:poke cont
      rl+2,0
2160  poke contrl+6,1:poke inti
      n,0:vdisys(0)
2170  return
2180  COPYRIGHT:
2190  fullw 2 : clearw 2
2200  gotoxy 12,3 :print"Math G
      raphics"
2220  gotoxy 2,7:print"Copyrigh
      t 1987 COMPUTE! Pub., Inc
      ."
2230  gotoxy 8,9:Print "All Rig
      hts Reserved"
2240  for t=1 to 2000:next
2250  return
```

Program 2: MGRAF2.BAS

```
10    'Copyright 1987
      Publications Inc.
20    'All Rights Reserved
60    dim Old%(16,3):'array for
       color values
70    if peek(systab)=4 then go
      to MathGraphics
80    goto MEDIUMRES
90    MathGraphics:
100   gosub COPYRIGHT
110   gosub RECORD
120   gosub INITIALIZE
130   'Module 1:RightOvals--
140   R1=140
150   R2=20
160   R3=25
170   R4=65
180   Inc=Pi/64
190   Kolor=2
200   for Theta=0 to 2*TwoPi st
      ep Inc
210   color 1,1,Kolor
220   X1=FNPolarX(R1,Theta)
230   Y1=FNPolarY(R2,Theta)
240   X2=FNPolarX(R3,Theta+Pi)
250   Y2=FNPolarY(R4,Theta+Pi)
260   linef X2,Y2,X1,Y1
270   Kolor=Kolor+1:if Kolor>15
       then Kolor=2
280   next
290   gosub PAUSE
300   gosub ANIMATE:gosub WIPE
310   'Module 2:SideOvals--
320   R1=140
330   R2=28
340   R3=65
350   R4=65
360   Inc=Pi/64
```

```
370   Offset=Pi/3
380   Kolor=2
390   for Theta=0 to 3*TwoPi st
      ep Inc
400   color 1,1,Kolor
410   X1=FNPolarX(R1,Theta)
420   Y1=FNPolarY(R2,Theta)
430   X2=FNPolarX(R3,Theta+Offs
      et)
440   Y2=FNPolarY(R4,Theta)
450   linef X1,Y1,X2,Y2
460   Kolor=Kolor+1:if Kolor>15
       then Kolor=2
470   next
480   gosub PAUSE
490   gosub ANIMATE:gosub WIPE
500   'Module 3:TwistedBand--
510   R1=140
520   R2=28
530   R3=65
540   R4=65
550   Inc=Pi/64
560   Offset=Pi/3
570   Kolor=2
580   for Theta=0 to 3*TwoPi st
      ep Inc
590   color 1,1,Kolor
600   X1=FNPolarX(R1,Theta)
610   Y1=FNPolarY(R2,Theta)
620   X2=FNPolarX(R3,Theta)
630   Y2=FNPolarY(R4,Theta+Offs
      et)
640   linef X1,Y1,X2,Y2
650   Kolor=Kolor+1:if Kolor>15
       then Kolor=2
660   next
670   gosub PAUSE
680   gosub ANIMATE:gosub WIPE
690   'Module 4:MultiLobe--
700   R1=95
710   Inc=Pi/128
720   lobes=4
730   Kolor=2
740   for Theta=0 to 2*TwoPi st
      ep Inc
750   color 1,1,Kolor
760   R2=R1*sin(lobes*Theta)
770   X1=FNPolarX(R2,Theta)
780   Y1=FNPolarY(R2,Theta)
790   linef XCenter,YCenter,X1,
      Y1
800   Kolor=Kolor+1:if Kolor>15
       then Kolor=2
810   next
820   gosub PAUSE
830   gosub ANIMATE:gosub WIPE
840   'Module 5:SpiralCone--
850   R1=95
860   R2=68
870   Inc=Pi/160
880   Lobes=3
890   Kolor=2
900   for Theta=0 to 2*TwoPi st
      ep Inc
910   color 1,1,Kolor
920   X1=FNPolarX(R1,Theta*Lobe
      s)
930   Y1=FNPolarY(R2,Theta)
940   linef XCenter,YCenter,X1,
      Y1
950   Kolor=Kolor+1:if Kolor>15
       then Kolor=2
960   next
970   gosub PAUSE
980   gosub ANIMATE:gosub WIPE
990   'Module 6:SideSpiralCone-
      -
1000  R1=121
1010  R2=64
1020  Inc=Pi/160
1030  Lobes=3
1040  Kolor=2
1050  for Theta=0 to 2*TwoPi st
      ep Inc
1060  color 1,1,Kolor
1070  X1=FNPolarX(R1,Theta)
1080  Y1=FNPolarY(R2,Theta*Lobe
      s)
1090  linef XCenter,YCenter,X1,
      Y1
1100  Kolor=Kolor+1:if Kolor>15
       then Kolor=2
1110  next
1120  gosub PAUSE
1130  gosub ANIMATE:gosub WIPE
1140  'Module 7:Circles--
1150  R1=107
1160  R2=68
1170  R3=40
1180  R4=34
1190  Inc1=Pi/3
1200  Inc2=Pi/20
1210  Kolor=2
1220  for Theta=0 to TwoPi step
       Inc1
1230  color 1,1,Kolor
1240  for Theta2=0 to TwoPi ste
      p Inc2
1250  color 1,1,Kolor
1260  X1=FNPolarX(R1,Theta2)
1270  Y1=FNPolarY(R2,Theta2)
1280  X2=FNPolarX(R3,Theta)
1290  Y2=FNPolarY(R4,Theta)
1300  linef X1,Y1,X2,Y2
1310  Kolor=Kolor+1:if Kolor>15
       then Kolor=2
1320  next
1330  Kolor=Kolor+1:if Kolor>15
       then Kolor=2
1340  next
1350  gosub PAUSE
1360  gosub ANIMATE:gosub WIPE
1370  'Module 8:Spikes--
1380  R1=107
1390  R2=68
1400  R3=40
1410  R4=34
1420  Inc1=Pi/3
1430  Inc2=Pi/18
1440  Kolor=2
1450  for Theta=0 to TwoPi step
       Inc1
1460  color 1,1,Kolor
1470  for Theta2=0 to TwoPi ste
      p Inc2
1480  color 1,1,Kolor
1490  X1=FNPolarX(R1,Theta2)
1500  Y1=FNPolarY(R2,theta)
1510  X2=FNPolarX(R3,Theta)
1520  Y2=FNPolarY(R4,Theta2)
1530  linef X1,Y1,X2,Y2
1540  Kolor=Kolor+1:if Kolor>15
       then Kolor=2
1550  next
1560  Kolor=Kolor+1:if Kolor>15
       then Kolor=2
1570  next
1580  gosub PAUSE
1590  gosub ANIMATE:gosub WIPE
1600  FINISHED:
1610  'clean up and end the pro
      gram
1620  A%=GB:gintin=peek(A%+8):g
      intout=peek(A%+12):addrin
      =peek(A%+16)
1630  Text$="[0][!MathGraphics
      for ST    !]"
1640  Text$=Text$+"[ Re-run ! Q
      uit ]":Gosub ALERT
1650  if Key=2 then gosub PLAYB
      ACK:clearw 2:closew 2:end
1660  goto MathGraphics
1670  INITIALIZE:
1680  'run this program in the
      low-res mode
1690  title$="ST BASIC Graphics
      "
1700  gosub TITLEBAR:gosub HIDE
      MOUSE
1710  openw 2:fullw 2:clearw 2
1720  gosub WIPE
1730  'define constants
1740  Pi=3.14159
1750  TwoPi=2*Pi
1760  XCenter=151
1770  YCenter=83
1780  'define polar to Cartesia
      n conversion functions
1790  DEF FNPolarX(R,Theta)=r*c
      os(Theta)+XCenter
1800  DEF FNPolarY(R,Theta)=r*s
      in(Theta)+YCenter
1810  return
1820  PAUSE:
1830  for delay=1 to 5000:next
1840  return
1850  TITLEBAR:
1860  a%=gb:gintin=peek(a%+8)
1870  poke gintin+0,peek(systab
      +8):poke gintin+2,2
1880  s%=gintin+4:title$=title$
      +chr$(0)
1890  poke s%,varptr(title$):ge
      msys(105)
1900  return
1910  MEDIUMRES:
1920  'prompt user to switch to
       low-res
1930  A%=GB:gintin=peek(A%+8):g
      intout=peek(A%+12):addrin
      =peek(A%+16)
1940  Text$="[3][!MathGraphics
      for ST is designed!   to
      run in Low Resolution][ O
      .K. ]"
1950  gosub ALERT:end
1960  ALERT:
1970  'put message into alertbo
      x and display on screen
1980  gosub SHOWMOUSE
1990  N%=addrin:poke gintin,0
2000  Text$=Text$+chr$(0)+chr$(
      0)
2010  poke N%,varptr(Text$)
2020  gemsys(52)
2030  Key=peek(gintout)
2040  return
2050  WIPE:
2060  'quickly paint the screen
       black
2070  color 1,1:poke contrl,114
      :poke contrl+2,2:poke con
      trl+6,0
2080  poke ptsin,1:poke ptsin+2
      ,22:poke ptsin+4,304
2090  poke ptsin+6,188:vdisys(0
      )
2100  return
2110  RECORD:
2120  'peek old color values an
      d store in array
2130  for Kolor=0 to 15
2140  poke contrl,26:poke contr
      l+2,0:poke contrl+6,2
2150  poke intin,Kolor:poke int
      in+2,0:vdisys(0)
2160  Old%(Kolor,0)=peek(intout
      +2)
2170  Old%(Kolor,1)=peek(intout
      +4)
2180  Old%(Kolor,2)=peek(intout
      +6)
2190  next Kolor
2200  return
2210  PLAYBACK:
2220  'put old color values bac
      k
2230  for Kolor=0 to 15
2240  poke contrl,14:poke contr
      l+2,0:poke contrl+6,4:pok
      e intin,Kolor
```

```
2250  poke intin+2,Old%(Kolor,0
      )
2260  poke intin+4,Old%(Kolor,1
      )
2270  poke intin+6,Old%(Kolor,2
      )
2280  vdisys(0)
2290  next Kolor
2300  return
2310  BLUES:
2320  'turn lines on and off in
       cyan
2330  poke contrl,14:poke contr
      l+2,0:poke contrl+6,4:pok
      e intin,Kolor
2340  poke intin+2,Old%(10,0)
2350  poke intin+4,Old%(10,1)
2360  poke intin+6,Old%(10,2)
2370  vdisys(0)
2380  return
2390  BLACKOUT:
2400  'turn all colors black
2410  poke contrl,14:poke contr
      l+2,0:poke contrl+6,4:pok
      e intin,Kolor
2420  poke intin+2,Old%(1,0)
2430  poke intin+4,Old%(1,1)
2440  poke intin+6,Old%(1,2)
2450  vdisys(0)
2460  return
2470  ANIMATE:
2480  'perform simulated animat
      ion
2490  for Kolor=2 to 15:gosub B
      LACKOUT:next
2500  Kolor=15:Cycle=300
2510  while Cycle
2520  gosub BLACKOUT:if Kolor=1
      5 then Kolor=1
2530  Kolor=Kolor+1:gosub BLUES
      :Cycle=Cycle-1
2540  wend
2550  gosub PLAYBACK
2560  return
2570  HIDEMOUSE:
2580  'hide the mouse pointer
2590  poke contrl,123:poke cont
      rl+2,0
2600  poke contrl+6,0:vdisys(0)

2610  return
2620  SHOWMOUSE:
2630  'bring the mouse pointer
      back
2640  poke contrl,122:poke cont
      rl+2,0
2650  poke contrl+6,1:poke inti
      n,0:vdisys(0)
2660  return
2670  COPYRIGHT:
2680  fullw 2 : clearw 2
2690  gotoxy 12,3 :print"Math G
      raphics"
2710  gotoxy 2,7:print"Copyrigh
      t 1987 COMPUTE! Pub., Inc
      ."
2720  gotoxy 8,9:Print "All Rig
      hts Reserved"
2730  for t= 1 to 2000:next
2740  clearw 2
2750  return
```

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Compress And Decompress

Jason Coleman

This pair of Apple II programs helps you store more hi-res picture files on a disk. ProDOS is required.

"Compress" and "Decompress" are two programs designed for use with hi-res graphics files for Apple II series computers using ProDOS. Their purposes are simple. Program 1, Compress, packs a hi-res picture file into a smaller space than normal. Program 2, Decompress, unpacks the picture.

Type in and save both programs. Program 1 is a BASIC program, while Program 2 is written in machine language and must be typed in with the "MLX" machine language entry program found elsewhere in this issue. Here are the addresses you need to enter Program 2 with MLX:

STARTING ADDRESS?	2000
ENDING ADDRESS?	2247

Program 1 handles the job of compressing a picture file, and it displays instructions for using both programs. When you run it, Program 1 prompts you through every step of the process of compressing a picture file. Simply follow the on-screen instructions.

Program 2 decompresses a previously compressed file. Use the following command to install the program:

```
BRUN DECOMPRESS
```

Next, activate the high-resolution graphics area with the following command:

```
HGR
```

Now whenever you want to load a compressed picture file, use a command of the following form:

```
DECOMPRESS filename, slot, drive, address
```

You must always supply a filename to tell this program which file to decompress. The remaining parameters are optional and need only be supplied if you wish to use a different slot, drive number, or load address. You may specify the load address in either decimal or hexadecimal (base 16) numbering. To specify a hexadecimal load address, put a dollar sign ($) in front of the address.

Program 1: Compress

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
CE 10 REM COPYRIGHT 1987 COMPUTE
      ! PUBLICATIONS, INC.
69 20 REM ALL RIGHTS RESERVED.
55 25 HOME
51 30 PRINT "COPYRIGHT 1987": PR
      INT "COMPUTE! PUBLICATIONS
      , INC.": PRINT "ALL RIGHTS
       RESERVED."
E5 60 FOR I = 768 TO 950: READ J
      : POKE I,J: NEXT
24 70 DATA 169,0,141,180,3,165,7
      ,72,160,0,177,6,205,180,3,
      208,15,238,180,3,208,4,104
      ,198,6,96,104,72,133,7,208
      ,232,208,208,231,104,72,24
      ,105,32,230,7,197,7,208,22
      0,104,133,7,24,105,32,72,1
      77,6,141,181,3,173,180
DD 80 DATA 3,145,8,200,132,26,16
      2,1,177,6,205,181,3,240,4,
      32,89,3,202,232,208,77,202
      ,32,89,3,202,240,246,141,1
      82,3,132,25,164,26,224,4,1
      44,41,173,180,3,145,8,200,
      208,2,230,9,138,145,8,200,
      208,2,230,9,173,181,3
1B 90 DATA 145,8,200,208,2,230,9
      ,132,26,164,25,173,182,3,1
      41,181,3,162,1,96,141,182,
      3,173,181,3,145,8,200,208,
      2,230,9,202,208,246,240,22
      5,200,208,162,230,7,104,72
      ,197,7,208,154,104,32,89,3
      ,164,26,136,132,8,96,0,0,0
44 100 HOME
FC 110 HTAB 11: INVERSE : PRINT
      "PICTURE.COMPRESSOR": NOR
      MAL
21 120 PRINT : PRINT "THIS PROGR
      AM CAN COMPRESS MOST HI-R
      ES   PICTURES TO CONSERVE
       SPACE ON YOUR DISK.THE A
      MOUNT OF SPACE SAVED DEPE
      NDS ON THECOMPLEXITY OF T
      HE PICTURE."
9F 130 PRINT : PRINT "SOMETIMES,
       EXTREME COMPLEXITY OF TH
      E    ORIGINAL PICTURE WIL
      L MAKE IT IMPOSSIBLEFOR T
      HE COMPRESSOR TO GAIN ANY
       DISK     SPACE BY COMPRE
      SSING.   IF THIS IS THE
      CASE IN YOUR PICTURE, YOU
       WILL BE TOLD  SO."
1D 135 PRINT : PRINT "PRESS <RET
      URN>";: INPUT "";RT$
6A 138 HOME
B0 140 PRINT : PRINT "DECOMPRESS
      ING THE 'PACKED' PICTURES
       IS  DONE BY USING THE 'D
      ECOMPRESS' COMMAND  PROGR
      AM."
FC 145 PRINT
4E 146 PRINT "TO USE 'DECOMPRESS
      ', FIRST BRUN IT TO INSTA
      LL IT.  THEN, YOU TYPE:
                'DECOMPRESS FILE
      NAME (,S)(,D)(,A$HHHH)OR(
      ,ADDDD)'":PRINT "SLOT, DR
      IVE, AND ADDRESS PARAMETE
      RS ARE OPTIONAL.  (ADDRES
      S CAN BE USED TO LOAD"
38 147 PRINT "THE PICTURE ON ANO
      THER PAGE."
68 150 PRINT : PRINT
79 160 PRINT "WHAT SLOT IS YOUR
      DISK IN";: INPUT SL
87 170 PRINT "WHAT DRIVE";: INPU
      T DV
FB 180 PRINT CHR$ (4)"PREFIX,S"S
      L",D"DV
83 182 PRINT : PRINT "IS YOUR PI
      CTURE IN A SUBDIRECTORY";
      : INPUT YN$: IF LEFT$ (YN
      $,1) = "Y" THEN GOSUB 700
33 185 PRINT "FILENAME OF PICTUR
      E?";: INPUT "";NP$
78 186 IF LEN (NP$) < 15 THEN NP
      $ = NP$ + " ": GOTO 186
60 190 PRINT CHR$ (4)"PREFIX": I
      NPUT PX$
65 200 PRINT CHR$ (4)"OPEN  "PX$
      ",TDIR"
DE 210 PRINT CHR$ (4)"READ "PX$
2F 220 INPUT A$: IF MID$ (A$,2,1
      5) = NP$ THEN 250
14 230 GOTO 220
7A 250 PRINT CHR$ (4)"CLOSE"
D4 260 LA$ = RIGHT$ (A$,4)
61 270 FT$ = MID$ (A$,18,3)
2E 280 BK$ = MID$ (A$,27,2)
C6 290 IF FT$ < > "BIN" THEN 500
55 300 IF LA$ < > "4000" AND LA$
       < > "2000" AND LA$ < > "
      1FFF" AND LA$ < > "3FFF"
      THEN 500
75 310 POKE 6,0: POKE 8,0
68 320 IF LA$ = "2000" OR LA$ =
      "1FFF" THEN POKE 7,64: PO
      KE 9,32:S = 8192:OA = 163
      84: IF LA$ = "1FFF" THEN
      OA = OA - 1
45 330 IF LA$ = "4000" OR LA$ =
      "3FFF" THEN POKE 7,32: PO
      KE 9,64:S = 16384:OA = 81
      92: IF LA$ = "3FFF" THEN
      OA = OA - 1
33 340 PRINT CHR$ (4)"BLOAD "NP$
      ",A"OA
EC 350 CALL 768
05 355 IF PEEK (6) < > 0 THEN 60
      0
E8 357 SA = PEEK (8) + 256 * PEE
      K (9)
5A 360 IF SA > S + 8192 - 512 TH
      EN 600
B8 465 PRINT CHR$ (4)"DELETE "NP
      $
48 470 PRINT CHR$ (4)"BSAVE "NP$
      ",A"S",E"SA
1B 475 IF SA - S < 513 THEN CB =
       1: GOTO 485
29 480 CB = 2 + INT ((SA - S) /
      512)
69 485 PRINT : PRINT : PRINT "YO
      UR PICTURE HAS BEEN COMPR
      ESS FROM "BK$"  BLOCKS TO
       "CB" BLOCKS."
67 487 PRINT : PRINT "TO DECOMPR
      ESS THE PICTURE AGAIN, JU
      ST   'BRUN DECOMPRESS' AN
      D USE THE DECOMPRESSCOMMA
      ND TO UNPACK THE PICTURE.
      "
9E 490 END
B4 500 HOME : PRINT "THIS FILE I
      S NOT A HI-RES PICTURE.";
       CHR$ (7): END
C7 600 HOME : PRINT "THIS PICTUR
      E IS TOO COMPLEX TO GAIN
      ANY DISK SPACE BY COMPRES
      SING."; CHR$ (7): END
98 700 PRINT : PRINT "WHAT IS TH
      E NAME OF THE SUBDIRECTOR
      Y";: INPUT SB$
A5 710 PRINT CHR$ (4)"PREFIX "SB
      $
1B 720 RETURN
```

Program 2: Decompress

Please refer to the "MLX" article in this issue before entering the following program.

```
2000: A9 02 20 F5 BE 90 06 38 75
2008: A9 0E 4C 09 BE AE 07 BE 38
2010: 8E 3B 21 AE 08 BE 8E 3C 0A
2018: 21 A0 00 8C 07 BE AA 8E F0
2020: 35 20 B9 00 21 C9 21 D0 7D
2028: 03 8A D0 07 C9 22 D0 03 92
2030: E8 8A CA 99 00 98 C8 D0 3F
2038: E9 EE 24 20 AD 24 20 C9 B7
2040: 23 F0 05 EE 35 20 D0 DA 84
2048: 8E 08 BE B9 57 20 F0 06 68
2050: 20 ED FD C8 D0 F5 60 A7 2F
2058: C4 C5 C3 CF CD D0 D2 C5 FE
2060: D3 D3 A7 A0 C3 CF CD CD 45
2068: C1 CE C4 A0 C9 CE D3 D4 E5
2070: C1 CC CC C5 C4 AE 8D 8D 44
2078: D7 D2 C9 D4 D4 C5 CE A0 DB
2080: C2 D9 A0 CA C1 D3 CF CE 25
2088: A0 C3 CF CC C5 CD C1 CE 88
2090: 8D CA D5 CE C5 AC A0 B1 C5
2098: B9 B8 B6 8D 8D 00 00 00 FF
20A0: 00 00 00 00 00 00 00 00 E0
20A8: 00 00 00 00 00 00 00 00 E8
20B0: 00 00 00 00 00 00 00 00 F0
20B8: 00 00 00 00 00 00 00 00 F8
20C0: 00 00 00 00 00 00 00 00 01
20C8: 00 00 00 00 00 00 00 00 09
20D0: 00 00 00 00 00 00 00 00 11
20D8: 00 00 00 00 00 00 00 00 19
20E0: 00 00 00 00 00 00 00 00 21
20E8: 00 00 00 00 00 00 00 00 29
20F0: 00 00 00 00 00 00 00 00 31
20F8: 00 00 00 00 00 00 00 00 39
2100: D8 A0 00 A2 00 B9 00 02 E9
2108: C8 C9 A0 F0 F8 29 DF DD 4E
2110: 3D 21 D0 25 E8 E0 0A D0 55
2118: EC CA BE 52 BE A2 00 86 81
2120: 09 8E 53 BE E8 8E 54 BE C9
2128: A2 84 8E 55 BE A9 47 8D BC
2130: 50 BE A9 21 8D 51 BE 18 D8
2138: 60 38 4C 9E BE C4 C5 C3 84
2140: CF CD D0 D2 C5 D3 D3 A9 F3
2148: 0A 8D B4 BE AD 6C BE 8D 9F
2150: B5 BE AD 6D BE 8D B6 BE 02
2158: A9 C4 20 70 BE B0 48 AD A2
2160: B8 BE C9 06 F0 04 A9 0D 40
2168: 38 60 2C 57 BE 30 0C AD 56
2170: B9 BE 8D 58 BE AD BA BE 57
2178: 8D 59 BE A5 74 8D CF BE 42
2180: AD 58 BE 85 06 AD 59 BE 38
2188: 85 07 A9 00 8D CE BE AD 57
2190: 6C BE 8D CC BE AD 6D BE 7D
2198: 8D CD BE A9 03 8D CB BE 2C
21A0: A9 C8 20 70 BE 90 01 60 8F
21A8: AD D0 BE 8D D6 BE A9 04 AF
21B0: 8D D5 BE A2 00 8E D7 BE D9
21B8: 8E D9 BE E8 8E DA BE E8 65
21C0: BE D8 BE 20 D1 21 B0 6F 3E
21C8: B9 00 02 8D 48 22 C8 D0 2E
21D0: 08 A9 CA 20 70 BE A0 00 9C
21D8: 60 B9 00 02 CD 48 22 F0 9E
21E0: 1C 84 08 A4 09 91 06 C8 01
21E8: D0 02 E6 07 84 09 A4 08 FA
21F0: C8 CC DB BE D0 E3 20 D1 5A
21F8: 21 90 DE B0 3A C8 CC DB 41
2200: BE D0 05 20 D1 21 B0 2F 1E
2208: B9 00 02 AA C8 CC DB BE 04
2210: D0 05 20 D1 21 B0 20 B9 E4
2218: 00 02 84 08 A4 09 91 06 60
2220: C8 D0 02 E6 07 CA D0 F6 A7
2228: 84 09 A4 08 CB CC DB BE F5
2230: D0 A7 20 D1 21 90 A2 A9 22
2238: 01 8D DD BE AD D6 BE 8D DB
2240: DE BE A9 CC 20 70 BE 60 46
                                  ©
```

Fractal Mountains For Amiga

Matthew Timmerman

With this landscape-generating program and a 512K Amiga computer, you can create fascinating graphics displays based on the principles of fractal geometry.

"Fractal Mountains for Amiga" is an intriguing graphics program that draws landscape-like scenes containing rough, crinkled-looking mountain shapes. Although you can run it and simply enjoy the pictures it creates, the program is based on highly advanced mathematical concepts which you may wish to learn more about. Type in the program and save a copy before you run it.

When you run Fractal Mountains, it asks you to enter a number for the random seed. This value determines which landscape the program generates. There are 65,536 possible landscapes, so you needn't repeat a landscape very often unless you find one you like particularly. Enter a number in the range indicated by the onscreen prompt. (The first time you run the program, try entering 70 for the random seed.)

The second prompt asks you to enter a number for the maximum variation. This value determines the cragginess of the mountains. Although the program prompts you to enter a value in the range 0–2, you aren't necessarily limited to that range. A variation of 0 gives you a perfectly flat plane (no variation), while a value of 2 gives you extremely high, rugged mountain peaks. (The first time you run the program, try entering 1.96 for the maximum variation.)

After you've entered those values, the program draws the landscape. Please be patient while the process is underway. Although Amiga BASIC is one of the fastest microcomputer BASICs, it still takes considerable time to perform the tens of thousands of calculations this program requires.

This is only 1 of 65,536 possible landscapes with "Fractal Mountains for Amiga."

Once the picture is complete, you can save the picture to disk by pressing the S key. To show you what is happening, the program draws a white line on the screen indicating which line of the picture it is saving. The picture is saved in ILBM (InterLeaved BitMap) format, which allows you to load it into *Deluxe Paint*, *Graphicraft*, and other IFF-compatible art programs. To exit the program, press the space bar.

If you find a mountain that you like, but it is too smooth, use the same random seed value with a higher maximum variation. If you get a landscape which is mostly water, try it again using a negative maximum variation. The negative value inverts the landscape: What was once land becomes water, and vice versa. Since gravity is meaningless in this universe, pictures look as good upside down as they do right side up. Don't be afraid to experiment with different values. Not all combinations give pleasing results, but exploration is one of the interesting aspects of using a program like this.

Why Fractals?

A fractal is an object with a *fractional dimension*—a value between 1 and 2, for instance, or between 2 and 3. In his book *The Fractal Geometry of Nature*, Benoit Mandelbrot tells us to imagine a piece of aluminum foil. When it's flat, it is a simple plane with two dimensions. As you begin to crinkle the foil, it can no longer be confined to two dimensions, but it is not yet three-dimensional. Therefore, it has a dimension somewhere 2 and 3. The aluminum foil becomes more crinkled until, eventually, it becomes a solid block filling three dimensions.

The same analogy can be applied to a straight line becoming bent until it becomes infinitely bent and complex, completely darkening the surface on which it is drawn. At that point, the line is no longer a line, but a two-dimensional plane.

Another aspect of fractals is self-similarity, meaning that the big parts of the object look like the little parts. To take a rough example, if you break a chunk of rock from a mountain, the rock looks like a miniature mountain. It's not the same, but it has the same general look. This phenomenon occurs throughout nature: in tree bark,

snowflakes, coastlines of continents, trees, clouds, surfaces of proteins, all types of turbulence, and the positioning of stars, planets, solar systems, and galaxies—all of which are only a few of the countless possibilities.

The algorithm used to create these pictures is derived from one described in the September 1984 issue of *Scientific American*. However, whereas that formula was based on a triangle, this one is based on a square (for display purposes).

To understand how the program works, imagine that you begin with a square, putting a point in the center of all four sides of the shape. Next, raise or lower those points a random amount, as much as half the length of the square. At that point, you put a point in the center of the square and give it the average height of all the corners. Raise or lower this point by a random amount, using the same conditions as in the previous adjustment, and connect the points.

You now have four smaller squares. By repeating this process, you obtain smaller and smaller squares, eventually obtaining a good approximation of a natural landscape surface.

The most difficult part of making a convincing mountain is putting the picture on the screen. This program draws the mountains as if the sun were directly above them, for a couple of reasons. Since the algorithm produces no overhanging pieces, you don't have to worry about one part of the landscape shadowing another part. Secondly, the program already takes a considerable time to work, without adding the extra complication and delay of computing the effect of light falling at an angle.

The landscape is stored as a square grid of height values in an array named *lv*. In order to draw the landscape, each surface in the array must be given a "shade value" in relation to how bright the surface appears. The subroutine *Getshade* calculates the shade value as the slope of the plane in relation to the light source.

The problem is that the four points do not necessarily fall all on the same plane. For this reason, a point is placed in the center of each square and a separate shade value is calculated for all four triangles that are formed. What you get is an aerial view of mountains, islands, or whatever happens to come out. The waterline is at zero, meaning that all points in the viewing area with negative values are covered with water. In addition, snow covers all peaks more than three-quarters as high as the highest point in the picture.

Fractal Mountains For Amiga

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
'Copyright 1987 Compute! Publica
tions, Inc.
'All Rights Reserved.
CLEAR 32767
DEFSNG a-z
DIM Lv(64,64)
DIM cmap$(31)
PRINT"    Copyright 1987"
PRINT"Compute! Publications, Inc
."
PRINT"  All Rights Reserved.":PR
INT
RANDOMIZE
PRINT "Enter maximum variation (
0-2) (1 is nice) ";:INPUT max
PRINT "Enter a filename to save
picture under."
INPUT "(Saving at end is optiona
l.)   ";fiL$
FOR a = 1 TO 10
PRINT RND
NEXT
SCREEN 2,320,200,5,1
WINDOW 3,"Mountain",(0,0) - (311
,186),28,2
FOR a = 0 TO 15
PALETTE a,a/15,a/25,a/50
PALETTE a+16,a/15,a/15,a/15
a$ = CHR$(a*17)
cmap$(a) = a$+CHR$(a*10.2)+CHR$(
a*5.1)
cmap$(a+16) = a$+a$+a$
NEXT
PALETTE 16,0,.25,.5
cmap$(16) = CHR$(0)+CHR$(64)+CHR
$(128)
COLOR 15
maxLv = 0
MakeMount:
FOR iter = 6 TO 1 STEP -1
sk = 2 ^ iter
hL = sk/2
PRINT "Doing Iteration";iter
Dotops:
PRINT "Tops & Bottoms  ";
FOR y = 0 TO 64 STEP sk
FOR x = hL TO 64 STEP sk
ran = (RND-.5)*max*sk
oLd = (Lv(x-hL,y) + Lv(x+hL,y))/
2
Lv(x,y) = oLd + ran
NEXT x
NEXT y
Dobottoms:
PRINT "Sides  ";
FOR x = 0 TO 64 STEP sk
FOR y = hL TO 64 STEP sk
ran = (RND-.5)*max*sk
oLd = (Lv(x,y-hL) + Lv(x,y+hL))/
2
Lv(x,y) = oLd + ran
NEXT y
NEXT x
Docentres:
PRINT "Centers  "
FOR x = hL TO 64 STEP sk
FOR y = hL TO 64 STEP sk
ran = (RND-.5)*max*sk
oLd1 = (Lv(x+hL,y-hL) + Lv(x-hL,
y+hL))/2
oLd2 = (Lv(x-hL,y-hL) + Lv(x+hL,
y+hL))/2
oLd = (oLd1 + oLd2)/2
Lv(x,y) = oLd + ran
IF Lv(x,y) > maxLv THEN maxLv =
Lv(x,y)
NEXT y
NEXT x
NEXT iter
snowLine = maxLv - maxLv/4
drawmount:
CLS
xm = 4
ym = 1
xshift = .5
yp = 70
FOR x = 0 TO 64
IF Lv(x,0) < 0 THEN Lv(x,0) = 0
NEXT x
FOR y = 0 TO 63
IF Lv(0,y) < 0 THEN Lv(0,y) = 0
FOR x = 0 TO 63
IF Lv (x+1,y+1) < 0 THEN Lv(x+1,
y+1) = 0
Lv = Lv(x,y) + Lv(x+1,y) +Lv(x,y
+1)
Lv = (Lv + Lv(x+1,y+1))/4
a=x:b=y
rx1 = xm * a + xshift * b
ry1 = ym * b + yp -Lv(a,b)
GOSUB getshade:
shade1 = shade
a=x+1
rx2 = xm * a + xshift * b
ry2 = ym * b + yp -Lv(a,b)
GOSUB getshade:
shade2 = shade
a=x:b=y+1
rx3 = xm * a + xshift * b
ry3 = ym * b + yp -Lv(a,b)
GOSUB getshade:
shade3 = shade
a=x+1
rx4 = xm * a + xshift * b
ry4 = ym * b + yp -Lv(a,b)
GOSUB getshade:
shade4 = shade
a=x+.5:b=y+.5
rx = xm * a + xshift * b
ry = ym * b + yp
a=x:b=y
ry = ry - Lv
AREA (rx,ry)
AREA (rx1,ry1)
AREA (rx2,ry2)
COLOR shade1
AREAFILL
AREA (rx,ry)
AREA (rx2,ry2)
AREA (rx4,ry4)
COLOR shade2
AREAFILL
AREA (rx,ry)
AREA (rx1,ry1)
AREA (rx3,ry3)
COLOR shade3
AREAFILL
AREA (rx,ry)
AREA (rx3,ry3)
AREA (rx4,ry4)
COLOR shade4
AREAFILL
NEXT x
NEXT y
```

```
ender:←
a$ = INKEY$←
IF a$ = "s" THEN GOTO savepic←
IF a$ <> " " THEN GOTO ender←
end2:←
WINDOW CLOSE 3←
SCREEN CLOSE 2←
WINDOW OUTPUT 1←
END←
getshade:←
c = x + 1 - (b-y)←
d = y + (a-x)←
xc = x+.5←
yc = y+.5←
xrun1 = xc - a←
xrun2 = xc - c←
yrun1 = yc - b←
yrun2 = yc - d←
rise1 = Lv - Lv(a,b)←
rise2 = Lv - Lv(c,d)←
yrise = ABS(rise1*xrun2 - rise2
*xrun1)←
yrun = ABS(yrun1*xrun2 - xrun1*y
run2)←
IF yrun = yrise THEN yrun = 1:yr
ise = 1←
xrise = ABS(rise1*yrun2 - rise2*
yrun1)←
xrun = ABS(xrun1*yrun2 - yrun1*x
run2)←
IF xrun = xrise THEN xrun = 1:xr
ise = 1←
xrise = xrise / 2←
yrise = yrise / 2←
xshade = 1-ABS(xrise / (xrun + x
rise))←
yshade = 1-ABS(yrise / (yrun + y
rise))←
shade = 14*xshade*yshade+1 ←
IF Lv > snowLine THEN shade = sh
ade + 16←
IF Lv <= 0 THEN shade = 16←
RETURN←
savepic:←
rastport& = WINDOW(8)←
bitmap& = PEEKL(rastport&+4)←
topLine = 60 - INT(maxLv)←
IF topLine < 0 THEN topLine = 0←
topadd = topLine * 40←
FOR a = 0 TO 4←
pLane&(a) = PEEKL(bitmap& + 8 +
a*4)+topadd←
NEXT←
bottomLine = 144←
Lines = bottomLine - topLine←
OPEN fiL$ FOR OUTPUT AS 1←
a$ = MKL$(Lines * 40 * 5 + 144)←
PRINT#1,"FORM";a$;"ILBMBMHD";MKL
$(20);←
PRINT#1,MKI$(320);MKI$(Lines);MK
L$(0);←
PRINT#1,CHR$(5);MKI$(0);CHR$(0);
←
PRINT#1,MKI$(0);CHR$(10);CHR$(11
);←
PRINT#1,MKI$(320);MKI$(200);←
PRINT#1,"CMAP";MKL$(96);←
FOR a = 0 TO 31←
PRINT#1,cmap$(a);←
NEXT←
PRINT#1,"BODY";MKL$(Lines * 40 *
5);←
FOR a = 1 TO Lines←
FOR p = 0 TO 4←
FOR b = 0 TO 39 STEP 4←
PRINT#1,MKL$(PEEKL(pLane&(p) + b
));←
NEXT b←
POKEL pLane&(p),-1←
pLane&(p) = pLane&(p) + 40←
NEXT p←
NEXT a←
CLOSE←
GOTO end2←
←
```

Pop-Up ASCII Table For IBM

Paul W. Carlson

This handy utility provides an instant list of all IBM characters and their ASCII equivalents—and it's available at any time with the touch of a key.

The IBM PC/PCjr has a very rich character set. Besides the usual punctuation marks, numbers, and upper- and lowercase letters, many other characters are available to BASIC programmers. Any character can be displayed in BASIC by using a statement such as PRINT CHR$(*n*), where *n* is the ASCII code for the character to be displayed. There are so many characters, however, that it's nearly impossible to remember the ASCII codes for all of them. Most programmers have to refer frequently to the BASIC manual for this information, which takes time and interrupts your train of thought.

"Pop-Up ASCII Table" is a memory-resident machine language program that displays a complete table of IBM characters, along with their ASCII codes, at the touch of a key. Whenever you press its hot-key combination, the ASCII table pops up for your inspection, even if you're running another program at the time. Listed below is a BASIC filemaker program which creates ASCIITBL.COM, the machine language program. Type in the program and run it to create the ASCIITBL.COM machine language file. (ASCIITBL.COM is the name of the file created by the BASIC program; you must use some other name for the BASIC program itself.)

ASCIITBL.COM is a memory-resident program, also known as a *terminate and stay resident* (TSR) program. This type of program runs only once to install itself in the computer's memory, then waits in the background for the special event which triggers it. This particular program is triggered by pressing a special key combination, called a *hot key*. The hot key for the Pop-Up ASCII Table program is Alt-A (hold down the Alt key and press A).

To install this program in memory, enter ASCIITBL at the DOS prompt. In about a second, the DOS prompt reappears. Although nothing seems to have happened, the program has installed itself in memory and is quietly waiting to be activated by the hot-key combination. If you have an AUTOEXEC.BAT file on the disk you use to boot your system, you may want to add the line ASCIITBL to the batch file so the program will be installed automatically each time you boot the computer.

Once the program is installed, you can instantly bring the ASCII table onto the screen by pressing Alt-A. To hide the table and return to what you were doing, press the Esc key. This can be done at any time, even when you're in the mid-

dle of entering a BASIC program line. When you exit the ASCII table, the screen is restored exactly as it appeared before. Note that you *must* be in 80-column mode when you activate the ASCII table. If you are not, the program simply ignores the hot key.

When the table appears, you will notice that character codes 0, 7, 9–13, and 28–31 have a two-letter abbreviation after them. These are unprintable characters that perform a control function rather than causing a character to appear on the screen. Here is an explanation of those abbreviations:

NU	null character (zero)
BP	beep
TB	tab
LF	linefeed
FF	form feed
CR	carriage return
RT	cursor right
LT	cursor left
UP	cursor up
DN	cursor down

ASCIITBL.COM is designed primarily as an aid for BASIC programmers and it performs well in that environment. However, it also works with many other programs, including other memory-resident programs. Still, it may not be able to work with programs that take absolute control of the keyboard. The only way to tell for sure is to try it out.

Customizing ASCIITBL.COM

The Alt-A key combination was chosen because the letter *A* suggests ASCII. Should you want to use this program along with some other memory-resident program which also uses Alt-A, you can substitute another letter for *A*. The number in parentheses in line 30 is the extended scan code for the keypress that activates the program. To change the *A* in Alt-A to some other letter, replace the number in parentheses with a number from the following table.

30	Alt-A	49	Alt-N
48	Alt-B	24	Alt-O
46	Alt-C	25	Alt-P
32	Alt-D	16	Alt-Q
18	Alt-E	19	Alt-R
33	Alt-F	31	Alt-S
34	Alt-G	20	Alt-T
35	Alt-H	22	Alt-U
23	Alt-I	47	Alt-V
36	Alt-J	17	Alt-W
37	Alt-K	45	Alt-X
38	Alt-L	21	Alt-Y
50	Alt-M	44	Alt-Z

ASCIITBL.COM Filemaker

For instructions on entering this programs, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
BA 1 ' Program to create ASCIITB
     L.COM
OA 2 'Copyright 1987 Compute! Pu
     blications, Inc.
MC 3 'All Rights Reserved.
CL 4 CLS:PRINT"Copyright 1987":P
     RINT "Compute! Publications
     , Inc.":PRINT"All Rights Re
     served."
NP 5 FOR Z=1 TO 1500:NEXT
BO 6 CLS
DI 10 OPEN "ASCIITBL.COM" FOR OU
     TPUT AS 1
ML 20 PRINT#1,CHR$(&HE9);CHR$(&H
     80);CHR$(&H1);
KH 30 PRINT#1,CHR$(30);
IM 40 FOR N=1 TO 6:PRINT#1,CHR$(
     0);:NEXT
NN 50 T=0:FOR J=1 TO 646:READ A$
     :N=VAL("&H"+A$)
FD 60 T=T+N:PRINT#1,CHR$(N);:NEX
     T:CLOSE 1
NH 70 IF T=56547! THEN PRINT"ASC
     IITBL.COM SUCCESSFULLY CRE
     ATED!":END
LP 80 PRINT CHR$(7);"***** ERROR
      IN DATA STATEMENTS *****"
     :END
ID 90 DATA 00,00,00,00,00,00,83,
     02,2C,28
HH 100 DATA 2D,29,2A,2E,1E,AA,0F
     ,4E,55,0A
IB 110 DATA 14,42,50,4A,15,54,42
     ,EA,15,4C
AH 120 DATA 46,8A,16,48,4D,2A,17
     ,46,46,CA
EE 130 DATA 17,43,52,38,12,52,54
     ,D8,12,4C
FJ 140 DATA 54,78,13,55,50,18,14
     ,44,4E,50
BK 150 DATA 72,65,73,73,20,5B,45
     ,73,63,5D
MO 160 DATA 20,74,6F,20,63,6F,6E
     ,74,69,6E
QL 170 DATA 75,65,2E,2E,2E,2E,80
     ,3E,08,01
BI 180 DATA 00,75,22,FB,50,53,51
     ,52,56,57
HC 190 DATA 1E,06,E4,60,2E,3A,06
     ,03,01,75
DF 200 DATA 08,B4,02,CD,16,A8,08
     ,75,0D,07
CB 210 DATA 1F,5F,5E,5A,59,5B,58
     ,2E,FF,2E
IC 220 DATA 0C,01,E8,DF,00,0E,1F
     ,0E,07,B4
CL 230 DATA 0F,CD,10,3C,02,74,11
     ,3C,03,74
LD 240 DATA 0D,3C,07,74,09,07,1F
     ,5F,5E,5A
OB 250 DATA 59,5B,58,CF,88,3E,07
     ,01,C6,06
MK 260 DATA 08,01,01,B4,03,CD,10
     ,89,0E,09
BB 270 DATA 01,B4,01,B5,20,CD,10
     ,80,3E,04
IE 280 DATA 01,00,75,03,E8,84,00
     ,8B,3E,10
DE 290 DATA 01,E8,41,00,BB,A0,0F
     ,E8,55,00
KA 300 DATA 80,3E,04,01,00,75,03
     ,E8,7C,00
IC 310 DATA B4,00,CD,16,3C,1B,75
     ,F8,80,3E
MK 320 DATA 04,01,00,75,03,E8,5B
     ,00,BB,00
HN 330 DATA 00,E8,33,00,80,3E,04
     ,01,00,75
CJ 340 DATA 03,E8,5A,00,B4,01,8B
     ,0E,09,01
BK 350 DATA CD,10,C6,06,08,01,00
     ,EB,8E,8A
BJ 360 DATA 1E,07,01,32,FF,57,E8
     ,2A,00,8B
AB 370 DATA F7,5F,1E,8E,1E,05,01
     ,B9,D0,07
IP 380 DATA FC,F3,A5,1F,C3,8B,36
     ,10,01,03
PE 390 DATA F3,8A,1E,07,01,32,FF
     ,E8,0B,00
OD 400 DATA 8E,06,05,01,FC,B9,D0
     ,07,F3,A5
OD 410 DATA C3,B8,00,10,F7,E3,8B
     ,F8,C3,BA
EL 420 DATA DA,03,EC,A8,08,74,FB
     ,83,EA,02
DA 430 DATA B0,25,EE,C3,B4,0F,CD
     ,10,8D,1E
CL 440 DATA 12,01,D7,BA,D8,03,EE
     ,C3,E4,61
FF 450 DATA 8A,E0,0C,80,E6,61,8A
     ,C4,E6,61
MO 460 DATA FA,B0,20,E6,20,FB,C3
     ,C6,06,04
EJ 470 DATA 01,00,C7,06,05,01,00
     ,88,B4,0F
ED 480 DATA CD,10,3C,07,75,11,FE
     ,06,04,01
FP 490 DATA 81,2E,05,01,00,08,B9
     ,0D,0C,3C
DK 500 DATA 07,EB,03,B9,07,06,B4
     ,01,CD,10
BK 510 DATA B9,D0,07,8B,3E,10,01
     ,81,C7,A0
DE 520 DATA 0F,B8,20,07,F3,AB,8B
     ,3E,10,01
QM 530 DATA 81,C7,A2,0F,8B,DF,8B
     ,FB,B9,18
IJ 540 DATA 00,A0,0B,01,3C,17,77
     ,09,83,EF
ME 550 DATA 02,C6,05,B3,83,C7,02
     ,B2,00,3C
JE 560 DATA C8,72,09,C6,05,32,2C
     ,C8,B2,01
HP 570 DATA EB,0B,3C,64,72,07,C6
     ,05,31,2C
DB 580 DATA 64,B2,01,47,47,D4,0A
     ,05,30,30
GM 590 DATA 80,FC,30,75,07,80,FA
     ,00,75,02
DB 600 DATA B4,20,88,25,47,47,88
     ,05,47,47
FA 610 DATA 47,47,A0,0B,01,88,05
     ,47,47,47
CE 620 DATA 47,C6,05,B3,81,C7,94
     ,00,80,3E
DF 630 DATA 0B,01,FF,74,0B,FE,06
     ,0B,01,E2
MH 640 DATA 9C,83,C3,0E,EB,92,8D
     ,1E,19,01
BK 650 DATA B9,0B,00,BE,00,00,8B
     ,3E,10,01
EA 660 DATA 8B,00,03,F8,46,46,8A
     ,00,88,05
HD 670 DATA 46,47,47,8A,00,88,05
     ,46,E2,E8
PJ 680 DATA 8B,3E,10,01,81,C7,D8
     ,1E,8D,1E
QK 690 DATA 45,01,B9,1A,00,BE,00
     ,00,8A,00
FL 700 DATA 88,05,46,47,47,E2,F7
     ,B4,33,B0
FC 710 DATA 09,CD,21,89,1E,0C,01
     ,8C,06,0E
LP 720 DATA 01,B4,25,B0,09,8D,16
     ,5F,01,CD
ON 730 DATA 21,BA,C3,21,CD,27 ©
```

XpressCard Filing System For The Commodore 64

Robert Bixby

Though it's small in size—only 2K—this Commodore 64 filing program packs plenty of wallop. "XpressCard" lets you store an amazing 60K of information in memory at a single time. Written in machine language, this compact program lets you enter and retrieve data, search and sort records, load and save entire files, and perform other basic filing functions. A disk drive is required.

How much software do you have that takes full advantage of the Commodore 64's hidden memory? Concealed under the computer's BASIC and Kernal ROM (Read Only Memory) chips are more than 16,000 bytes of memory which ordinary programs rarely tap. "XpressCard" is a fast, convenient filing system that takes full advantage of those underused areas, yet the program itself is only 2K in length. It's the electronic equivalent of a conventional card file, providing over 60K of quick-access storage. With easy-to-remember function key commands, you can load and save files, search and alphabetize records, insert and delete records from a file, and even make hardcopy printouts.

XpressCard is written in machine language, so you'll need to enter it with the "MLX" machine language entry program printed elsewhere in this issue. When you run MLX, you'll be asked for the starting address and ending address of the data you'll be entering. Here are the values to use for XpressCard:

Starting address: 0801
Ending address: 0FF8

Follow the MLX instructions carefully and be sure to save a copy of the XpressCard data before you quit typing. Once you have saved a copy, the program can be handled just as if it were BASIC. If you saved the program with the filename XPRESSCARD, for instance, you can start it by entering the command LOAD"XPRESSCARD",8 followed by RUN. To make new copies, simply load the program into memory, change disks, and save it as you would a BASIC program.

Moving Around The Card File

Once you have entered XpressCard, load and run the program as if it were an ordinary BASIC program. When you begin, the program presents the equivalent of a blank file card. Since you haven't loaded anything into memory or entered any data, you begin with the first card, which is numbered 001. The highest card in the file is numbered 237.

The upper portion of the screen (above the solid line on the display) is where you enter data for the current card and review its contents. A single card can hold up to 255 characters—about six-and-a-half screen lines. Below the solid line you will see the contents of the next higher card (if that card happens to contain data).

Four of the 64's function keys are used to move around in the card file. The f7 key actually has two functions: It both saves the current data in memory and moves you to the next card in the file. This feature saves time when you are entering a lot of data in numerical order. The f8 key (press SHIFT-f7) moves you back one card (but it does not save the current card). If you are already at card 001 and you press f8, you move to card 237. If you're already at card 237 and you press f7, XpressCard both saves card 237 and moves you forward to card 001. The f6 key (SHIFT-f5) returns you instantly to card 001 no matter which card you're currently working on.

Entering And Editing Data

The flashing underline cursor in the top screen area indicates your position within the current card. You can enter text in this editing window as if you were writing with a word processor. You can use the cursor keys to move around within the editing area. If you type beyond the capacity of one card, or if you move the cursor beyond the last character in the card, XpressCard automatically saves the contents of

the current card and moves you forward to the next card. Otherwise, you must press f7 to save the current card and move ahead.

The RETURN key has no effect in the editing window. To begin a new line, use the cursor keys or simply hold down the space bar until the cursor wraps around to the beginning of the next screen line. To erase text from the card, press the INST/DEL key. It's also possible to insert text with SHIFT-INST/DEL. The bottom 256 spaces of the screen represent a buffer, or temporary storage area. If you insert blank spaces in the current card so that characters scroll past the end of the card, the data automatically goes into the buffer rather than onto the next card. The buffer contents can be recovered with the retrieve function (see below).

You can clear the editing window at any time by pressing SHIFT-CLR/HOME.

Special Functions

The f5 key activates a special mode that provides a number of additional editing features. Whenever you press f5, XpressCard changes the border color and waits for you to press a second key. Most of the f5-mode functions return to the editing window after performing their operations. For others, you must press RETURN to return to editing the current card. You can also press RETURN to cancel the f5 mode.

In the special f5 mode, XpressCard recognizes the following keys:

CRSR up/down. Allows moving by large increments. Pressing the CRSR up/down key alone in f5 mode moves you immediately to card 049, while pressing SHIFT in conjunction with CRSR up/down moves you to card 097. Press the Commodore key along with CRSR up/down to move to card 145, or CTRL with CRSR up/down to move to card 193.

A. Alphabetizes the cards in memory, beginning with card 001 and ending with the card currently shown on the screen. Remember to move to the last card you want alphabetized before giving this command. If you have filled all 237 cards and want to alphabetize all of them, move to card 237 before selecting this option.

The cards are sorted alphabetically according to the first character on each card. Uppercase letters are considered equivalent to lowercase letters. To avoid sorting anomalies, letters are alphabetized before numbers and spaces. Nonalphanumeric characters such as graphics symbols have the lowest priority of all.

Note that this function doesn't do a complete sort; only an ordering based on the first character position. For example, after alphabetizing all cards with the letter *A* in the first position will appear before any card with *B* in the first position, but within the group beginning with *A* the cards will appear in the order in which they were found in the file, and not in true alphabetical order.

C. Clears the buffer at the bottom of the screen.

D. Deletes the current card (the one shown in the editing window at the top of the screen), storing its contents in the buffer. All cards above the current card are copied down into the next lower card. Thus, after a deletion, the current card will contain the contents that were in the next higher card.

Delete takes longer for low cards than for high ones. In order to perform a deletion, the program must move around the contents of all higher cards. The lower the card, the more cards that must be moved.

F. Performs a position-sensitive string search. Before activating this feature, move to an empty card so that you'll have a clean space to enter the search string. Type the string you want to search for *in exactly the same location within the blank card where you expect it to appear in existing cards.* Once that's done, press SHIFT-RETURN to copy the search string into the buffer at the bottom of the screen. Next, move to the card where you want the search to begin. (To search all cards, press f6 to move to card 001.) Finally, press f5 followed by F.

XpressCard begins at the card currently on the screen and searches forward for a card which matches the search pattern. If a match is found, that card will become the current card in the editing window. You can enter f5 mode and press F again to search for the next matching card in the file. If no matches are found, you return to card 001.

Spaces in the search string are treated as wildcard symbols; a space can match any character. Thus, the search string S N (S followed a space followed by N) matches the strings SANE, SUN, SAND, and any other card containing the characters S and N in the same relative position within the card.

SHIFT-F. Performs a string search that is not position-sensitive. That is, it finds strings that match the search string, no matter where those strings might appear in their respective cards. The process for setting up the search string is the same as for the F option, but no wildcards (spaces) are permitted in the search string, and the search string must begin in the upper left corner of the buffer.

For this search, XpressCard treats the space character as a delimiter rather than as a wildcard. The first space character in the search pattern marks the end of the pattern. Thus, if you type FOR RENT as the search string, the program might find spurious matches such as INFORMATION, AFFORDABLE, BALFOR, or FORTITUDE, since all of those words contain the characters FOR. In this case, it might be more appropriate to search for RENT.

I. Copies the contents of each card beginning with the current card and moving to the next higher card. If you need to make many copies of a card—perhaps as a template or pattern—insertion provides an easy way to do it.

Insert takes longer for lower-numbered cards than for higher ones. In order to perform an insertion, the program must move the contents of all higher cards. The lower the card, the more cards that have to be moved.

Be careful about inserting when the card file is nearly full. Insertion causes all cards above the insertion point to move upward in memory. However, the information in card 237 has nowhere to go during an insertion. Thus, whatever card 237 contained is simply lost during each insertion.

L. Loads a card file into memory for review, printing, or some other operation. Remember to put an A

before the filename for files that contain fewer than 192 cards, and a B at the beginning of the name for larger files.

P. Prints the current card on a printer. Be sure the printer is connected and turned on before you select this option. Note that XpressCard prints ordinary alphanumeric characters (letters, numerals, and punctuation) but ignores graphics symbols, printing them as blank spaces.

The default printing mode for XpressCard is to print each file card exactly as it appears on the screen, with a width of 40 columns and height of six lines. If needed, however, you can alter the printer formatting by making three POKEs in direct mode before you run the program. To do this, load XpressCard as usual, but do not run it. Enter this line and press RETURN:

```
POKE 702,47
```

This POKE prevents XpressCard from using the default printer settings. Next, determine how many columns wide the printout should be and how many characters you want to print from each card. POKE those values into locations 703 and 704, respectively. For instance, you might use these settings to print an address label containing three lines of text, enough for a name, address, and city, state, and zip code:

```
POKE 703, 40
POKE 704,120
```

The first POKE retains the default width of 40 columns, and the second tells XpressCard to print the first 120 characters from each card.

R. Retrieves the contents of the buffer, moving that data into the current card at the top of the screen. The previous contents of the card will be lost; the data in the buffer remains unchanged. This feature also allows you to make multiple copies of a card.

S. Saves the file, beginning at card 001 and including the card currently on the screen. Data in cards beyond the current one is ignored when you save, so be sure to move to the last active card in your file before giving this command. This feature allows you to save a file that's smaller than the maximum 237-card size, which takes up about 242 disk blocks.

You'll be asked for a filename for your data file. When specifying a filename for the save, *you must use a name no more than 15 characters in length.* If the file contains fewer than 192 cards, XpressCard automatically adds the character *A* to the beginning of the filename you specified. When reloading the file, be sure to add *A* to the beginning of the name you used.

Very large files (more than 192 cards) are automatically broken into two disk files: XpressCard automatically adds *A* to the beginning of the first filename and *B* to the beginning of the second file. When reloading such a file, load the *B* portion first. XpressCard will then automatically load the *A* portion after the other part is in memory.

4. Displays a listing of the disk directory (think of the dollar sign in the shifted position of this key). To freeze the listing, hold down the space bar. When you release the space bar, the listing continues. Press RETURN after the listing is complete to return to the editing window.

RUN/STOP. Exits to BASIC. It is wise to save your data file before you choose this option. However, after exiting you can type RUN and reenter XpressCard with your data intact as long as you don't perform any other BASIC operations in the meantime.

Miscellaneous Functions

The f4 and f1 offer two additional features. The f4 key erases the data in every card from the current card to card 237. Since this drastic action is irreversible, XpressCard requires that you confirm it by pressing Y before it proceeds.

The f1 key accesses two additional pages (256-byte chunks) of buffer memory. This allows you to save the current contents of the buffer before you erase all files, for instance. The contents of the three buffer storage areas are rotated into the active buffer in a cyclical pattern.

XpressCard

Please refer to the "MLX" article in this issue before entering the following program.

```
0801:0B 08 FF FF 9E 32 30 39 EF
0809:39 00 31 08 FF FF 8F 14 8F
0811:14 14 14 14 14 14 14 14 21
0819:50 52 4F 47 52 41 4D 20 96
0821:42 59 20 52 4F 42 45 52 32
0829:54 20 42 49 58 42 59 00 C6
0831:00 00 A5 01 29 FE 85 01 57
0839:A9 80 8D 8A 02 A9 00 85 D4
0841:19 85 FD 8D B3 02 20 97 55
0849:0B A9 10 85 1A 85 FE A9 32
0851:0F 8D 20 D0 8D 21 D0 20 10
0859:40 0F AD BE 02 C9 2F F0 75
0861:1C A9 2F 8D BE 02 A9 00 F9
0869:8D BF 02 A9 28 8D C0 02 06
0871:A9 01 8D C1 02 A9 06 8D B4
0879:C2 02 20 95 0C 20 C5 0B 40
0881:20 5A 0F A0 00 84 C6 8C 50
0889:BD 02 20 E4 FF 20 4B 0C 6E
0891:F0 F8 C9 11 D0 18 AD BD A2
0899:02 18 69 27 90 08 A9 13 5B
08A1:20 D2 FF 4C 81 08 8D BD 40
08A9:02 A9 11 4C 34 09 C9 87 EC
08B1:D0 03 4C BB 0C C9 91 D0 AB
08B9:18 AD BD 02 38 E9 29 B0 85
08C1:08 A9 13 20 D2 FF 4C 81 55
08C9:08 8D BD 02 A9 91 4C 34 79
08D1:09 C9 9D D0 1A CE BD 02 23
08D9:CE BD 02 AC BD 02 C0 FE 42
08E1:D0 0A A0 00 8C BD 02 A9 F9
08E9:13 4C F7 08 4C 34 09 C9 25
08F1:94 D0 03 4C 18 0E C9 13 45
08F9:D0 07 A0 00 A9 13 4C 4B C5
0901:09 C9 14 D0 03 4C 43 0E 77
0909:C9 8D D0 03 4C F7 0D C9 D3
0911:93 D0 0B 20 62 0F A9 13 3A
0919:4C F7 08 4C 81 08 C9 0D E1
0921:D0 03 4C 8B 08 C9 85 90 A1
0929:0A C9 8D B0 06 20 31 0B 8D
0931:4C 81 08 AC BD 02 C8 C0 DD
0939:FF D0 0F 20 D2 FF 20 74 AE
0941:0B 20 68 0D 20 62 0F 4C B3
0949:08 0E 8C BD 02 20 D2 FF 86
0951:4C 8B 08 90 0E 08 13 11 3E
0959:11 11 11 11 11 11 60 60 59
0961:60 60 60 60 60 60 60 60 73
0969:60 60 60 60 60 60 60 60 7B
0971:60 60 60 20 20 20 20 20 BB
0979:20 20 D8 D0 52 45 53 53 6D
0981:C3 41 52 44 20 20 20 20 36
0989:13 00 93 53 41 56 45 3A F4
0991:20 00 A2 00 86 02 8E B9 1B
0999:02 A9 41 8D EB 07 E6 FE 60
09A1:A5 FE C9 CF 90 06 85 02 26
09A9:A9 CF 85 FE BD 8B 09 F0 44
09B1:07 20 D2 FF E8 4C AD 09 86
09B9:A0 00 84 C6 20 CF FF 99 F2
09C1:EC 07 C8 C0 0F B0 04 C9 3E
09C9:0D D0 F1 C0 02 B0 01 60 16
09D1:8C E8 07 A9 08 A2 08 A0 5B
09D9:FF 20 BA FF AD E8 07 A2 0D
09E1:EB A0 07 20 BD FF A9 00 36
09E9:85 22 A9 10 85 23 A9 22 AB
09F1:A6 FD A4 FE 20 D8 FF 20 DF
09F9:CC FF AD B9 02 D0 04 A5 C4
0A01:02 F0 42 A0 00 84 02 A9 64
0A09:10 85 1A A9 41 85 FE A9 2C
0A11:CF 85 1C 84 1B 84 19 20 77
0A19:52 0F B1 19 8D C3 02 20 81
0A21:13 0E AD C3 02 91 1B C8 89
0A29:D0 F0 E6 1A E6 1C A5 1C 6F
0A31:D0 E8 20 5A 0F AD B9 02 36
0A39:D0 0B A9 42 8D EB 07 8D 89
0A41:B9 02 4C D4 09 60 93 4C C6
0A49:4F 41 44 3A 20 00 A2 00 C7
0A51:BD 47 0A F0 07 20 D2 FF C4
0A59:E8 4C 51 0A A8 84 C6 20 C4
0A61:CF FF 99 EB 07 C8 C9 0D 4B
0A69:D0 F5 C0 02 B0 01 60 8C 72
0A71:E8 07 A9 08 A2 08 A0 FF E7
0A79:20 BA FF AD E8 07 A2 EB BB
0A81:A0 07 20 BD FF A9 00 A2 D0
0A89:FF A0 FF 20 D5 FF 20 CC 83
0A91:FF AD EB 07 C9 42 D0 2A 22
0A99:A9 41 8D EB 07 A0 00 84 82
0AA1:19 84 1B A9 10 85 1C A9 D9
0AA9:CF 85 1A 20 52 0F 20 13 6E
0AB1:0E C8 D0 FA E6 1A E6 1C 52
0AB9:A5 1A D0 F2 20 5A 0F 4C 45
```

```
0AC1:73 0A 60 20 CC FF A9 00 D9
0AC9:A0 FF A2 FF 20 BD FF A9 24
0AD1:04 AA A0 07 20 BA FF 20 23
0AD9:C0 FF A2 04 20 C9 FF A9 B4
0AE1:1B 20 D2 FF A9 00 20 D2 46
0AE9:FF A0 00 A2 00 B9 00 04 3B
0AF1:C9 20 B0 05 69 40 4C 09 47
0AF9:0B C9 40 90 0B C9 60 B0 08
0B01:05 69 80 4C 09 0B A9 20 B0
0B09:20 D2 FF C8 CC BF 02 F0 CA
0B11:0E E8 EC C0 02 90 D6 A9 BB
0B19:0D 20 D2 FF 4C EC 0A A9 EB
0B21:0D 20 D2 FF C8 CC C1 02 1F
0B29:90 F5 20 CC FF 4C 08 0E 25
0B31:C9 85 D0 27 A2 00 20 52 C1
0B39:0F BD D0 06 85 02 BD 00 70
0B41:FE 9D D0 06 BD 00 FF 9D 44
0B49:00 FE A5 02 9D 00 FF E8 C9
0B51:D0 E7 20 5A 0F A9 13 20 D8
0B59:D2 FF 60 C9 8A D0 04 20 41
0B61:68 0C 60 C9 8B D0 08 A9 B0
0B69:10 85 FE 20 C5 0B 60 C9 AF
0B71:88 D0 13 20 B1 0B E6 FE EA
0B79:A5 FE C9 FD 90 04 A9 10 33
0B81:85 FE 20 C5 0B 60 C6 FE E0
0B89:A5 FE C9 10 B0 04 A9 FC 52
0B91:85 FE 20 C5 0B 60 A0 00 A5
0B99:A9 D8 85 1A A9 00 85 19 7E
0BA1:A9 00 91 19 C8 D0 F9 E6 B4
0BA9:1A A5 1A C9 DC 90 F1 60 83
0BB1:20 15 0C 20 52 0F A0 00 B0
0BB9:B9 00 04 91 FD C8 D0 F8 F3
0BC1:20 5A 0F 60 A0 01 20 45 F4
0BC9:0F 20 52 0F A0 00 B1 FD 11
0BD1:99 00 04 C8 D0 F8 20 15 31
0BD9:0C A0 00 E6 FE A5 FE C9 E2
0BE1:FD 90 04 A9 10 85 FE B1 7C
0BE9:FD 99 40 05 C8 D0 F8 A5 DE
0BF1:FE C9 10 D0 04 A9 FD 85 51
0BF9:FE C6 FE 20 5A 0F A9 20 A5
0C01:8D FF 04 8D 00 05 8D 04 6C
0C09:05 A0 00 99 40 06 C8 C0 D1
0C11:90 90 F8 60 A5 FE 38 E9 3E
0C19:0F A2 2F 38 E9 64 E8 90 0E
0C21:03 4C 1C 0C 18 69 64 8E CF
0C29:01 05 A2 2F 38 E9 0A E8 B0
0C31:90 03 4C 2D 0C 18 69 0A 4C
0C39:8E 02 05 A2 2F 38 E9 01 13
0C41:E8 90 03 4C 3E 0C 8E 03 59
0C49:05 60 85 02 AC BD 02 B9 E6
0C51:00 04 8D B6 02 A9 64 99 A0
0C59:00 04 A9 00 85 D4 AD B6 39
0C61:02 99 00 04 A5 02 60 20 37
0C69:5A 0F A0 00 B9 79 0C F0 43
0C71:13 20 D2 FF C8 4C 6D 0C D3
0C79:13 43 4C 45 41 52 20 41 9E
0C81:4C 4C 3F 00 A9 00 85 C6 D9
0C89:20 E4 FF F0 FB C9 59 F0 A4
0C91:03 4C 05 0E 20 52 0F A5 CD
0C99:FE 85 1A A0 00 84 19 A9 CD
0CA1:20 91 19 C8 D0 FB E6 1A 3C
0CA9:A5 1A C9 FE 90 F1 20 5A 2B
0CB1:0F A9 93 20 D2 FF 20 C5 CC
0CB9:0B 60 A9 02 8D 20 D0 A5 F8
0CC1:C5 C9 40 F0 F5 C9 01 D0 EF
0CC9:03 4C 08 0E C9 0B D0 06 7A
0CD1:20 6D 0F 4C E8 0F C9 14 27
0CD9:D0 03 4C E8 0F C9 3F D0 22
0CE1:07 A5 01 09 01 85 01 60 18
0CE9:C9 0A D0 06 20 5B 0E 4C BA
0CF1:05 0E C9 21 D0 06 20 68 A2
0CF9:0D 4C 05 0E C9 12 D0 06 6B
0D01:20 97 0D 4C 05 0E C9 15 80
0D09:D0 0B AD 8D 02 D0 03 4C 82
0D11:A0 0E 4C D3 0E C9 11 D0 50
0D19:03 4C E8 0D C9 29 D0 03 4D
0D21:4C C4 0A C9 0D D0 06 20 48
0D29:93 09 4C 05 0E C9 2A D0 E5
0D31:06 20 4F 0A 4C 05 0E C9 3D
0D39:36 D0 29 AD 8D 02 D0 07 BF
0D41:A9 40 85 FE 4C 05 0E C9 3D
0D49:01 D0 07 A9 70 85 FE 20 4B
0D51:05 0E C9 02 D0 07 A9 A0 61
0D59:85 FE 4C 05 0E A9 D0 85 0E
0D61:FE 4C 05 0E 4C C0 0C A9 B6
0D69:07 8D 20 D0 20 B1 0B 20 79
0D71:52 0F A9 00 85 19 85 1B 64
0D79:A9 FD 85 1A A9 FC 85 1C A2
0D81:A0 00 20 13 0E C8 D0 FA 51
0D89:C6 1C C6 1A A5 1A C5 FE A8
0D91:D0 EE 20 5A 0F 60 A9 06 CC
0D99:8D 20 D0 20 52 0F A9 00 C0
0DA1:85 19 85 1B A5 FE 85 1A 75
0DA9:18 69 01 F0 1E 85 1C A0 39
0DB1:00 B1 19 99 D0 06 C8 D0 F5
0DB9:F8 A0 00 20 13 0E C8 D0 AD
0DC1:FA E6 1C E6 1A A5 1C C9 6E
0DC9:FD 90 EE 4C 93 0D 8C BD 51
0DD1:02 A0 00 B1 19 8D C3 02 B8
0DD9:20 13 0E AD C3 02 91 1B C9
0DE1:C8 D0 F0 AC BD 02 60 B9 ED
0DE9:D0 06 99 00 04 C8 D0 F7 FD
0DF1:20 B1 0B 4C 08 0E A0 00 68
0DF9:B9 00 04 99 D0 06 C8 D0 0C
0E01:F7 4C 81 08 20 C5 0B A9 B4
0E09:0F 8D 20 D0 8D 21 D0 4C FF
0E11:81 08 B1 1B 91 19 60 A0 2A
0E19:FF 88 B9 D0 06 C8 99 D0 F2
0E21:06 88 D0 F5 AD FF 04 8D DE
0E29:D0 06 A0 FF 88 B9 00 04 72
0E31:C8 99 00 04 88 CC BD 02 4D
0E39:D0 F2 A9 20 99 00 04 4C D2
0E41:8B 08 AC BD 02 C8 B9 00 3D
0E49:04 88 99 00 04 C8 D0 F5 97
0E51:A9 20 8D FF 04 A9 9D 4C 4A
0E59:D2 08 A9 04 8D 20 D0 20 05
0E61:52 0F A9 10 85 1A 85 1C 5C
0E69:A9 00 85 19 85 1B A8 B1 38
0E71:19 20 19 0F 85 02 E6 1C 54
0E79:A5 1C C5 FE B0 0F B1 1B 58
0E81:20 19 0F C5 02 B0 EF 20 05
0E89:CF 0D 4C 70 0E E6 1A A5 47
0E91:1A 85 1C C5 FE 90 D8 A9 91
0E99:10 85 FE 20 5A 0F 60 A2 73
0EA1:FF E6 FE C9 FD 90 01 60 88
0EA9:20 C5 0B BD D0 06 C9 20 D6
0EB1:D0 18 CA 30 03 4C AC 0E 49
0EB9:4C 08 0E E6 FE A5 FE C9 84
0EC1:FD 90 E5 A9 10 85 FE 4C 39
0EC9:05 0E DD 00 04 D0 EC 4C 31
0ED1:B3 0E A2 00 BD D0 06 C9 A6
0ED9:20 F0 04 E8 4C D5 0E 86 AD
0EE1:02 E6 FE A5 FE C9 FD 90 9E
0EE9:07 A9 10 85 FE 4C 05 0E 8F
0EF1:20 C5 0B A2 00 A0 00 B9 57
0EF9:00 04 8D BB 02 BD D0 06 33
0F01:CD BB 02 F0 08 A2 00 C8 D7
0F09:D0 ED 4C E2 0E E8 E4 02 A2
0F11:F0 DB C8 F0 CC 4C F8 0E 5E
0F19:C9 20 D0 07 C0 00 F0 1C B2
0F21:A9 00 60 B0 03 18 69 40 B6
0F29:C9 5B B0 10 C9 41 B0 0E DC
0F31:C9 3A B0 08 C9 30 90 04 8D
0F39:18 69 2B 60 A9 FF 60 20 57
0F41:5A 0F A0 00 B9 54 09 D0 66
0F49:01 60 20 D2 FF C8 4C 45 32
0F51:0F 78 A5 01 29 FC 85 01 23
0F59:60 A5 01 09 02 85 01 58 42
0F61:60 A0 00 A9 20 99 00 04 DD
0F69:C8 D0 FA 60 A9 01 A2 08 24
0F71:A0 00 20 BA FF A9 01 A0 D8
0F79:0F A2 DE 20 BD FF 20 C0 94
0F81:FF A2 01 20 C6 FF A9 93 87
0F89:20 D2 FF 20 E4 FF 20 E4 BA
0F91:FF 20 E4 FF 20 E4 FF 20 09
0F99:E4 FF 20 E4 FF 20 E4 FF C6
0FA1:C9 42 D0 03 4C D1 0F C9 11
0FA9:22 D0 F2 20 E4 FF F0 08 7E
0FB1:C9 22 F0 04 C9 20 B0 08 D3
0FB9:A9 0D 20 D2 FF 4C 92 0F 86
0FC1:20 D2 FF A5 C5 C9 3C F0 BD
0FC9:15 C9 01 F0 03 4C AC 0F C5
0FD1:A5 C5 C9 01 D0 FA 20 C3 F3
0FD9:FF 20 CC FF 60 24 A5 C5 3E
0FE1:C9 3C F0 FA 4C AC 0F A0 95
0FE9:00 A9 20 99 D0 06 C8 D0 11
0FF1:FA 4C 05 0E 00 00 00 00 22
```

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ML Relocator

Samuel Ford

Here's a solution to a common problem—wanting to use two machine language programs that use the same memory space. For intermediate and advanced machine language programmers.

Sooner or later, most Commodore 64 programmers accumulate a collection of machine language (ML) programs that perform various useful tasks. One may be a BASIC enhancement, another may be a renumbering utility, and so forth. Inevitably, the day comes when you want to use two such programs at the same time, only to discover that both of them load into the same area of the computer's memory. Such conflicts are fairly common on the 64 because it contains a safe memory area (locations 49152–53247) reserved especially for that purpose.

Relocating BASIC programs is a snap: In fact, Commodore computers are designed to relocate a BASIC program automatically as part of the normal loading process. Machine language programs, on the other hand, usually work at one and only one location. Trying to relocate an ML program by hand can be a complicated process, since you need to adjust the targets of all JSR and JMP instructions that refer to locations in the program.

"ML Relocator" automates most of the process of relocating an ML program, allowing you to use favorite programs and utilities even if their original memory location is devoted to some other purpose. Type in and save Programs 1 and 2.

Program 1 is designed for machine language programs that do not occupy any part of BASIC program space (locations 2048–40959). In order to use the program, you must know the normal starting and ending address of the program you wish to relocate, plus the new starting address. If you're not sure of the starting and ending addresses of a program stored on disk, this short program will print them on the screen:

```
100 PRINT"FILENAME":INPUT F$
110 OPEN 2,8,2,"0:"+F$+",P,R"
120 GET #2,LO$:GET #2,HI$
130 ADR = (ASC(LO$+CHR$(0)) +
      [SPACE]256*ASC(HI$+CHR$
      (0)))
140 PRINT"STARTING ADDRESS";AD
      R
150 PRINT"CALCULATING SIZE..."
160 GET #2,X$:IF ST=0 THEN ADR
      =ADR+1:GOTO 160
170 PRINT "ENDING ADDRESS: ";A
      DR
180 CLOSE 2
```

Program 1 assumes that the program you wish to relocate is already in memory at its normal location. Load the ML program, as usual, before loading Program 1. Be sure to type NEW and press RETURN after loading the ML code, to reset the BASIC pointers.

When you run Program 1, it prints the prompt SOURCE: START, END. Type the program's normal starting and ending addresses, separating the two numbers with a comma. You may enter the addresses in either decimal or hexadecimal (base 16) numbers. To enter an address in hexadecimal, type a dollar sign ($) in front of the number. For instance, you would type $C000 to enter the hexadecimal equivalent of decimal 49152. After you enter those addresses, the program prints the prompt TARGET: START, indicating that you should enter the new address where you wish the ML code to begin.

The next step is very important. The program prompts you to enter areas of the ML program which you wish to skip. These areas may include variables, data tables, and anything else which is not executable ML code. This assumes, of course, that you have enough familiarity with the program to know where those areas are. If the program is one that you wrote, you already know where its data areas reside. For other programs, unless you have documentation about the program's structure, you will need to examine the code with a machine language monitor or disassembler.

Program 1 can remember the locations of up to 20 areas to skip. When specifying such an area, enter its starting and ending addresses. If the area is only one byte long, enter the address of that byte, type a comma, and press RETURN without specifying an ending address.

When you finish entering the locations of areas to skip, enter a comma and press RETURN without typing anything else.

After you perform these steps, the program adjusts the code in the areas you specified. The length of time this takes depends on the

length of the program involved. When this is done, you are given the option to relocate the program (enter Y or N as prompted). If you respond with no, the program ends, leaving the adjusted ML program in its original location. If you respond with yes, the program moves the adjusted program to its new location. At that point you can execute the relocated program in place or save it using a machine language monitor or similar means.

Relocating Before You Relocate

Program 2 is designed for relocating ML programs that normally reside somewhere in BASIC's program space. Such a program cannot be relocated by Program 1 because the program itself may corrupt the code you wish to relocate. Program 2 can lower the top or raise the bottom of BASIC, creating a safe space for the ML code to reside.

When you run Program 2, it prints the current bottom and top of BASIC program space—usually 2048 ($0801) and 40960 ($A000), respectively. Enter the new addresses you wish BASIC program space to have; then press RETURN. BASIC is reconfigured, and you may use Program 1 as described above.

No Magic Cure-All

ML Relocator is actually a very simple program. It runs through the specified memory area performing a partial disassembly of the code, looking for any ML instruction that uses absolute addressing. When it finds such an instruction, it checks whether the instruction's target address falls within the boundaries of the program it is relocating. If so, it calculates an address offset equal to the target address minus the source address.

As mentioned above, it's imperative that you tell the program which data areas to skip. If you don't, the program likely will become confused, mistaking data bytes for instructions that need adustment. If the data becomes garbled, the relocated program probably won't work at all.

In addition to raw data areas, there are some programming techniques which can't be handled by this simple method of relocation. For example, many programs set up a table of two-byte vectors which are used as the target for indirect JMP instructions or similar purposes. Another limitation has to do with zero-page indirect addressing, a very popular addressing mode in 6502/6510 machine language programming. For instance, consider this series of instructions:

```
LDA     #$00
STA     $FD
LDA     #$C1
STA     $FE
LDA     #$41
LDY     #$00
STA     ($FD),Y
```

These instructions store the character *a* (ASCII 65, hex $41) in location $C100, which we'll assume to be a variable located within the program to be relocated. The first four instructions store the address $C100 in two consecutive locations in the zero page (lowest 256 bytes) of the 64's memory. The last instruction references the location $C100 indirectly, using the address stored in locations 253–254 ($FD–$FE). Because the address $C100 never appears as a complete address in this code, ML Relocator can't tell that it needs adjustment.

In this and similar circumstances, you have no alternative but to examine the code with a monitor and adjust the addressing by hand. ML Relocator can take much of the drudgery out of relocating a program, but it's not a magic cure-all.

For instructions on entering these programs, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

Program 1: ML Relocator

```
EG 5 REM COPYRIGHT 1987 COMPUT
     E! PUBLICATIONS, INC.
     {3 SPACES}ALL RIGHTS RESE
     RVED.
FR 10 PRINT"{CLR}{5 SPACES}
     {RVS}ML RELOCATOR{OFF}
     {DOWN}"
HC 12 PRINT"{5 SPACES}COPYRIGH
     T 1987":PRINT"COMPUTE! P
     UBLICATIONS, INC."
BP 14 PRINT"{3 SPACES}ALL RIGH
     TS RESERVED."
GG 16 FOR X=1 TO 1000:NEXT
MA 20 DIM CD(255),TB(20,1)
DC 30 PRINT"{DOWN}SETTING UP..
     .";:FOR A=0 TO 255:READ
     {SPACE}CD(A):NEXT:PRINT"
     DONE"
AB 40 INPUT"{DOWN}SOURCE: STAR
     T,END";CS$,CE$
AP 41 N$=CS$:GOSUB 500:CS=N
GE 42 N$=CE$:GOSUB 500:CE=N
JG 50 INPUT"TARGET:{5 SPACES}S
     TART";TS$
GS 51 N$=TS$:GOSUB 500:TS=N
FS 60 NT=0:PRINT"{DOWN}ENTER S
     ECTIONS OF MEMORY TO SKI
     P,{7 SPACES}END WITH COM
     MA{DOWN}"
CJ 70 PRINT"TABLE"NT+1;:INPUT
     {SPACE}A$,B$
SS 72 IF A$="" THEN 100
JX 74 IF B$="" THEN B$=A$
SS 76 N$=A$:GOSUB 500:A=N:N$=B
     $:GOSUB 500:B=N
RQ 80 IF B=0 THEN B=A
JQ 85 IF A<CS OR A>CE OR B<CS
     {SPACE}OR B>CE OR B<A TH
     EN 70
FS 90 NT=NT+1:TB(NT,0)=A:TB(NT
     ,1)=B:GOTO 70
KH 100 PRINT"{DOWN}WORKING..."
BC 110 IF NT<2 THEN 120
JP 112 FOR A=NT TO 2 STEP-1:FO
     R B=1 TO A-1
MJ 114 IF TB(A,0)<TB(B,0) THEN
     T=TB(A,0):TB(A,0)=TB(B
     ,0):TB(B,0)=T
CP 116 NEXT B,A
JQ 120 TP=0:PT=CS:OF=TS-CS
XH 130 IF NT=TP THEN 140
PS 135 Z1=TP+1:IF PT=>TB(Z1,0)
     AND PT<=TB(Z1,1) THEN
     {SPACE}PT=TB(Z1,1)+1:TP
     =TP+1
PG 140 Z1=CD(PEEK(PT)):IF Z1<2
     THEN 160
PH 150 Z2=PEEK(PT+1)+PEEK(PT+2
     )*256
RR 155 IFZ2=>CSANDZ2<=CETHENZ2
     =Z2+OF:POKEPT+2,Z2/256:
     POKEPT+1,Z2-INT(Z2/256)
     *256
XD 160 PT=PT+Z1+1:IF PT<CE THE
     N 130
SF 170 PRINT"{DOWN}FINISHED. "
     ;:
EB 180 INPUT "RELOCATE (Y/N)";
     A$:IF A$<>"Y" AND A$<>"
     N" THEN 180
PS 190 IF A$="N" THEN END
KX 200 PRINT"{DOWN}WORKING..."
     ;
AJ 210 IF TS>CS THEN FOR A=CE
     {SPACE}TO CS STEP -1:PO
     KE A+OF,PEEK(A):NEXT
HD 220 IF TS<CS THEN FOR A=CS
     {SPACE}TO CE:POKE A+OF,
     PEEK(A):NEXT
RH 230 PRINT"DONE":END
PQ 500 N1$=LEFT$(N$,1):N$=MID$
     (N$,2)
XX 510 IF N1$<>"$" THEN N=VAL(
     N1$+N$):RETURN
QF 520 N=0:FOR N1=1 TO 4:N2=AS
     C(MID$(N$,N1,1))-55:N2=
     N2-7*(N2<10)
CS 530 N=N+N2*16↑(4-N1):NEXT:R
     ETURN
CS 1000 DATA 0,1,0,0,0,1,1,0,0
     ,1,0,0,0,2,2,0,1,1,0,0
     ,0,1,1,0,0,2,0,0,0,2,2
     ,0
QH 1010 DATA 2,1,0,0,1,1,1,0,0
     ,1,0,0,2,2,2,0,1,1,0,0
     ,0,1,1,0,0,2,0,0,0,2,2
     ,0
GE 1020 DATA 0,1,0,0,0,1,1,0,0
     ,1,0,0,2,2,2,0,1,1,0,0
     ,0,1,1,0,0,2,0,0,0,2,2
     ,0
FH 1030 DATA 0,1,0,0,0,1,1,0,0
     ,1,0,0,2,2,2,0,1,1,0,0
```

```
         ,0,1,1,0,0,2,0,0,0,2,2
         ,0
XK 1040  DATA 0,1,0,0,1,1,1,0,0
         ,0,0,0,2,2,2,0,1,1,0,0
         ,1,1,1,0,0,2,0,0,0,2,0
         ,0
CE 1050  DATA 1,1,1,0,1,1,1,0,0
         ,1,0,0,2,2,2,0,1,1,0,0
         ,1,1,1,0,0,2,0,0,2,2,2
         ,0
ED 1060  DATA 1,1,0,0,1,1,1,0,0
         ,1,0,0,2,2,2,0,1,1,0,0
         ,0,1,1,0,0,2,0,0,0,2,2
         ,0
BX 1070  DATA 1,1,0,0,1,1,1,0,0
         ,1,0,0,2,2,2,0,1,1,0,0
         ,0,1,1,0,1,2,0,0,0,2,2
         ,0
```

Program 2: BASIC Relocator

```
EG 5 REM COPYRIGHT 1987 COMPUT
     E! PUBLICATIONS, INC.
     {5 SPACES}ALL RIGHTS RESE
     RVED.
JC 10 PRINT"{CLR}{4 SPACES}
      {RVS}BASIC RELOCATOR
      {OFF}{DOWN}"
CK 12 PRINT"{4 SPACES}COPYRIGH
      T 1987":PRINT"COMPUTE! P
      UBLICATIONS, INC."
QP 14 PRINT"{2 SPACES}ALL RIGH
      TS RESERVED."
GG 16 FOR X=1 TO 1000:NEXT
FR 20 SB=PEEK(43)+PEEK(44)*256
      :EB=PEEK(55)+PEEK(56)*25
      6
GR 30 PRINT"{DOWN}CURRENT STAR
      T:"SB"{LEFT},";:N=SB:GOS
      UB 2000:PRINTHX$:SB$=HX$
RP 40 PRINT"CURRENT{3 SPACES}E
      ND:"EB"{LEFT},";:N=EB:GO
      SUB 2000:PRINTHX$:EB$=HX
      $
FD 50 PRINT"{DOWN}NEW START? "
      SB$"{7 LEFT}";:INPUT N$:
      GOSUB 1000:NS=N
PC 55 PRINT"NEW{3 SPACES}END?
      {SPACE}"EB$"{7 LEFT}";:I
      NPUT N$:GOSUB 1000:NE=N
MA 60 IF NE<NS THEN PRINT"
      {DOWN}TRY AGAIN":GOTO 50
JS 70 PRINT"{DOWN}COMPLETED."
DK 80 PRINT"{3 DOWN}POKE43,"NS
      -INT(NS/256)*256"{LEFT}:
      POKE44,"INT(NS/256)"
      {LEFT}:";
HR 81 PRINT"POKE55,"NE-INT(NE/
      256)*256"{LEFT}:POKE56,"
      INT(NE/256)"{LEFT}:POKE"
      NS"{LEFT},0:NEW";
GC 90 POKE 631,145:POKE 632,14
      5:POKE 633,13:POKE 198,3
GG 999 END
PP 1000 N1$=LEFT$(N$,1):N$=MID
        $(N$,2)
HS 1010 IF N1$<>"$" THEN N=VAL
        (N1$+N$):RETURN
PS 1020 N=0:FOR N1=1 TO 4:N2=A
        SC(MID$(N$,N1,1))-55:N
        2=N2-7*(N2<10)
SR 1030 N=N+N2*16↑(4-N1):NEXT:
        RETURN
DB 2000 H$="0123456789ABCDEF":
        HX$="$"
CC 2010 FOR N1=3 TO 0 STEP -1:
        N2=16↑N1:N3=INT(N/N2):
        N=N-N3*N2
DB 2020 HX$=HX$+MID$(H$,N3+1,1
        ):NEXT:RETURN
```

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SoftSprite

Richard Schramm

This compact machine language routine for Atari computers allows you to move playfield shapes rapidly anywhere on the screen using simple BASIC commands.

Eight-bit Atari computers—the 400, 800, XL, and XE models—have a variety of powerful graphics features. However, the only way to draw, move, or animate a playfield shape (any shape that's not a player/missile) from BASIC is with a series of PLOT or POKE statements, an extremely slow process. "SoftSprite" permits you to move such shapes quickly and easily, with simple BASIC commands.

SoftSprite can move, animate, or duplicate a playfield shape on any portion of the GRAPHICS 8 screen. The shapes may be any size, as long as the data for each shape does not exceed 250 bytes. SoftSprite also offers collision detection, and the only limit to the number of shapes is the amount of memory available. And since the SoftSprite machine language code is only 281 bytes long, you can use it in any BASIC program without sacrificing a lot of memory.

Type in the demonstration program and run it to see SoftSprite in action. The program contains extensive REMark statements to explain in detail how SoftSprite works; we'll refer to the code throughout this article.

Making A Shape Table

Before you call SoftSprite from BASIC, you must store two things in memory: the SoftSprite machine code itself and the shape data for the image you want to display. The simplest way to store the data is with loops that READ numbers from DATA statements and that POKE them into safe memory areas.

The shape data can be any size, depending on the image, up to a maximum of 256 bytes (see below). This data is organized into what we'll call a shape table, which is simply a list of numbers that defines the shape.

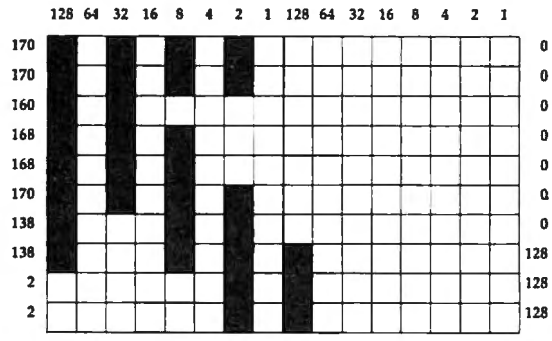
The figure illustrates how to construct a shape table. The shape we want to construct is an arrow like those shown in the demonstration program. By plotting the shape on graph paper, you easily can determine the numbers needed for its shape table.

This particular shape is ten dots high, so we draw a grid ten rows high. Each row of squares in the grid represents a row of dots in the arrow shape. The shape is nine dots wide. However, because it's easier for the program to deal with byte-length quantities, the shape table is 16 (2 * 8) columns wide. Thus, the grid for this shape is 10 dots high and 16 dots wide.

Within the grid, each group of eight horizontal squares represents a byte, or eight bits of memory. Each bit represents a power of 2, in ascending order from right to left. Thus, the rightmost bit has a value of 1, the next bit to the left has a value of 2, and so forth, up to the leftmost bit, which has a value of 128. The numbers at the top of the figure indicate the values assigned to each bit.

The next step is to fill in the squares where a dot will appear. Once this is done, you add up the bit values for each byte in the grid. The upper left byte, for instance, has a value of 170 (128 + 32 + 8 + 2 = 170). The upper right byte, however, has no darkened squares, so its value is zero. The lower right byte

Shape Table Grid



Shape Table For Arrow Image

0	reserved
0	reserved
0	reserved
0	reserved
10	height
2	width
170	row 1, column 1
0	row 1, column 2
170	row 2, column 1
0	row 2, column 2
160	row 3, column 1
0	row 3, column 2
168	row 4, column 1
0	row 4, column 2
168	row 5, column 1
0	row 5, column 2
170	row 6, column 1
0	row 6, column 2
138	row 7, column 1
0	row 7, column 2
138	row 8, column 1
128	row 8, column 2
2	row 9, column 1
128	row 9, column 2
2	row 10, column 1
128	row 10, column 2

has a value of 128, since only its leftmost bit is turned on, and so on.

Once you have written down the values for each byte in the grid, you are ready to construct the shape table. The first six bytes of the shape table are always reserved for SoftSprite's internal use. The first four of these bytes must be zeros, while the fifth and sixth bytes of the shape data represent the shape's height and width, respectively, in terms of bytes. In this case, the shape is 10 bytes high and 2 bytes wide, so the fifth and sixth bytes of its shape table are 10 and 2. The table illustrates the complete shape table for the arrow image.

The shape table can be a maximum of 256 bytes in length, including the six reserved bytes which begin the table. Thus, a shape can be a maximum of 250 bytes in size. You can calculate the size of the shape table by multiplying its height by its width and adding 6; the arrow shape table requires 26 (10 * 2 + 6) bytes.

Once the shape table is complete, you must find a safe memory area to store it. One common technique is to store the table in a string variable. The demonstration program shows how to do this. It first reserves the needed amount of memory with DIM, setting aside 278 bytes for the string SOFTSPRITE$ and 26 bytes for the string SHAPE$. The ADDR function lets us determine the addresses where the strings SOFTSPRITE$ and SHAPE$ begin. These values are assigned to the numeric variables SOFTSPRITE and SHAPE. (Since string variables and numeric variables are of different types, BASIC has no trouble distinguishing SOFTSPRITE from SOFTSPRITE$ and SHAPE from SHAPE$.)

After finding the addresses where the strings begin, we can use simple FOR-NEXT loops to READ the required values from DATA statements elsewhere in the program and to POKE them into the string space.

Calling SoftSprite From BASIC

The SoftSprite routine works in GRAPHICS 8, so the next step is to select that display mode. At this point, you are ready to display the shape with a USR statement. Here is the general syntax for calling SoftSprite with USR:

COL = USR(*ML address, x, y, shape address*)

The USR statement always takes four values inside parentheses. The first value is the address where the SoftSprite machine language routine begins. In the demonstration program, the variable SOFTSPRITE equals this address. The second and third parameters are the horizontal *(x)* and vertical *(y)* screen coordinates where you want the shape to appear. The fourth parameter is the memory address of the shape table (SHAPE in the demonstration program).

A simpler USR statement can be used to turn the shape off, once it is on the screen. In this case you can omit the coordinates, supplying only the address of the ML routine and the address of the shape data:

COL = USR(*ML address, shape address*)

Collision Detection

SoftSprite tests for collisions while it draws each byte of data from the shape table. The result of this test is stored in the variable which precedes the USR function (COL in the preceding statements). This variable is set to a nonzero value when a collision occurs and to zero when no collision takes place.

Experienced Atari programmers may have noticed that both the demonstration program and the arrow shape itself take advantage of an effect known as artifacting, which results when you display colored shapes (often a single pixel) in a higher resolution than the computer's display hardware can handle. Artifacting explains why only alternate columns of the arrow shape contain data. As a result, the arrow is either green or blue depending on whether it begins on an odd-numbered screen column or an even-numbered column. You can find more information about artifacting in *COMPUTE!'s Second Book of Atari Graphics*, available from COMPUTE! Books.

Artifacting also affects collision detection in SoftSprite. Simply put, SoftSprite cannot detect a collision between two artifacted shapes if they are different colors. For instance, if one shape is solid blue and the other is solid green, they can pass through one another without triggering a collision in SoftSprite. In that case, the area where the shapes overlap turns white. This effect can be observed in the demonstration program; when the moving arrow overlaps the blue arrow, no collision is detected, but the program does detect a collision when the moving arrow overlaps the green arrow. One way to circumvent the problem is to design one of the shapes so that it's completely enclosed by a solid border.

Animation

Lines 150 and 170 show how SoftSprite can copy a shape from the shape table to any portion of the display screen. The first USR call in line 150 puts the shape on the screen as usual. Next, the program

POKEs a zero into the first byte of the shape table. The effect of this POKE is to turn off the shape without removing its image from the screen. Once this is done, however, the data for that shape's location is lost, and the only way to erase it is to redraw it at exactly the same screen position.

You may copy a shape to the screen as many times as you like. The first and second bytes of the shape table contain the last screen address where the shape appeared, held in low byte/high byte format.

Animation is simply a matter of turning a series of shapes on and off at the same screen position. Unlike other bitmapped graphics routines, SoftSprite does not require that each frame of the animation be the same size.

The shapes drawn by SoftSprite will always flicker when you move them. Because the program shifts each byte of the shape as it is being drawn, there is not enough time during the computer's vertical blank interrupt to perform the shift. Because the drawing occurs outside the vertical blank period, some flickering is inevitable.

Softsprite does not check for boundary errors and faithfully draws the designated shape at whatever screen coordinates you assign. If you attempt to draw outside the screen boundaries, you might corrupt important information, such as the data stored above the computer's RAMTOP pointer. The only error checking performed by the program is to determine whether you have supplied the right number of parameters in the USR call.

Machine language programmers should note that SoftSprite uses nearly all of the computer's floating point registers; any attempt to call the SoftSprite ML code from within a vertical blank interrupt routine will probably cause a system crash.

SoftSprite Demonstration

For instructions on entering these programs, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
KL 5 REM COPYRIGHT 1987
BJ 6 REM COMPUTE! PUBLICATIO
     NS, INC.
FD 7 REM ALL RIGHTS RESERVED

PA 10 ? CHR$(125);"LOADING D
      ATA FILES.."
DD 20 REM reserve memory for
       SOFTSPRITE(9 SPACES)p
      rogram and shape table
       using(9 SPACES)string
      s:
MK 30 DIM SOFTSPRITE$(281),S
      HAPE$(26)
BL 40 REM initialize both st
      rings:
KK 50 SOFTSPRITE$(1)="A":SOF
      TSPRITE$(281)="A":SOFT
      SPRITE$(2)=SOFTSPRITE$
      :SHAPE$=SOFTSPRITE$
HL 60 REM find starting addr
      esses of(12 SPACES)SOFT
      SPRITE program and sha
      pe(10 SPACES)table:
LL 70 SOFTSPRITE=ADR(SOFTSPR
      ITE$):SHAPE=ADR(SHAPE$
      )
AH 80 REM load shape table i
      nto the(13 SPACES)memor
      y reserved for the str
      ing(8 SPACES)"SHAPE":
FA 90 FOR OFFSET=0 TO 25:REA
      D DATA:POKE SHAPE+OFFS
      ET,DATA:NEXT OFFSET
IB 100 REM load SOFTSPRITE p
       rogram into
       (10 SPACES)memory rese
       rved for the string
       (8 SPACES)"SOFTSPRITE
       ":
EO 110 FOR OFFSET=0 TO 280:R
       EAD DATA:POKE SOFTSPR
       ITE+OFFSET,DATA:NEXT
       OFFSET
BB 120 REM open screen to gr
       aphics 8 full
       (8 SPACES)screen mode
        with a black
       (14 SPACES)background:
AH 130 GRAPHICS 8+16:POKE 71
       0,0
CL 140 REM put shape on an e
       ven X(16 SPACES)coordi
       nate causing it to
       (14 SPACES)appear gree
       n:
DJ 150 COL=USR(SOFTSPRITE,10
       0,95,SHAPE):POKE SHAP
       E,0
MP 160 REM put shape on a od
       d X(18 SPACES)coordina
       te causing it to
       (14 SPACES)appear blue
       :
EE 170 COL=USR(SOFTSPRITE,18
       1,95,SHAPE):POKE SHAP
       E,0
AB 180 X=140:Y=95
EJ 190 REM put shape on even
        coordinate,
       (9 SPACES)but do not
       rubber-stamp it,
       (11 SPACES)will be use
       d as a sprite:
JP 200 COL=USR(SOFTSPRITE,X,
       Y,SHAPE):SOUND 0,COL,
       10,8
DE 210 REM scan keyboard for
        key press:
MP 220 KEY=PEEK(764):IF KEY=
       255 THEN 220
BB 230 IF KEY=14 THEN Y=Y-2:
       GOTO 200
DD 240 IF KEY=15 THEN Y=Y+2:
       GOTO 200
AC 250 IF KEY=6 THEN X=X-2:G
       OTO 200
AC 260 IF KEY=7 THEN X=X+2:G
       OTO 200
AM 270 IF KEY=33 THEN COL=US
       R(SOFTSPRITE,SHAPE):G
       OTO 220
GH 280 GOTO 220
ML 290 REM shape table of ar
       row, 1st four
       (8 SPACES)bytes MUST
       ALWAYS be zero:
       (12 SPACES)followed by
        height & width:
MM 300 DATA 0,0,0,0,10,2
KP 310 REM rest of shape tab
       le, actual(11 SPACES)s
       hape data of arrow:
EN 320 DATA 170,0,170,0,160,
       0,168,0,168,0,170,0,1
       38,0,138,128, 2,128,2
       ,128
HL 340 REM
OC 350 REM the folowing data
        file the(12 SPACES)SO
       FTSPRITE program :

HN 360 REM
KI 10000 DATA 216,104,133,22
         2,201,1,240,29,201,
         3,240,11,10,168,104
         ,136,208,252,169,32
         ,133,195,96,169,0,1
         33
IK 10010 DATA 222,104,133,22
         1,104,133,220,104,1
         04,133,219,104,133,
         225,104,133,224,160
         ,6,132,231,136,177,
         224,133
DI 10020 DATA 228,136,177,22
         4,133,229,133,230,1
         36,177,224,133,233,
         136,177,224,133,226
         ,136,177,224,133,23
         6,136,177
PP 10030 DATA 224,133,237,24
         0,87,169,0,133,235,
         165,226,133,227,166
         ,228,169,0,133,234,
         164,231,177,224,240
         ,10
CN 10040 DATA 164,233,240,6,
         74,102,234,136,208,
         250,5,235,72,164,22
         7,49,236,240,2,133,
         212,104,81,236,145
MK 10050 DATA 236,165,234,13
         3,235,230,227,230,2
         31,202,208,209,200,
         165,234,72,49,236,2
         40,2,133,212,104,81
         ,236
GL 10060 DATA 145,236,165,23
         6,24,105,40,133,236
         ,144,2,230,237,198,
         229,208,169,165,222
         ,240,16,201,6,240,9
FA 10070 DATA 160,0,132,212,
         132,213,152,145,224
         ,96,208,149,165,220
         ,41,7,133,233,160,3
         ,145,224,70,221,165
JJ 10080 DATA 220,106,74,74,
         133,226,136,145,224
         ,169,0,133,212,133,
         213,6,219,42,6,219,
         42,6,219,42,133
MK 10090 DATA 237,166,219,13
         4,236,6,219,42,6,21
         9,42,170,165,219,24
         ,101,236,133,236,13
         8,101,237,133,237,1
         65
BJ 10100 DATA 88,24,101,236,
         133,236,136,145,224
         ,165,89,101,237,133
         ,237,136,145,224,16
         5,230,133,229,169,6
         ,133
LC 10110 DATA 231,133,222,20
         8,161
```

The Power Of ON-GOTO And ON-GOSUB

Ronald R. Lambert

This tutorial details the use of ON-GOTO and ON-GOSUB, two of the most powerful statements in BASIC. Although the program examples are written in Atari BASIC, the principles apply to most microcomputers with BASIC.

ON-GOTO and ON-GOSUB are among the last commands learned by many new BASIC programmers. Even intermediate-level programmers may pass them up because the same results can be achieved by IF-THEN statements and logical comparisons. But the power of ON-GOTO and ON-GOSUB is appreciable. Once you learn how to use these commands, you'll wonder how you got along without them for so long.

The ON commands are used in program branching in cases where the value of some expression (a variable, calculation, and so on) determines the program line where execution goes next. This seems straightforward enough; but there is more to these commands than meets the eye. We'll look at how to handle these commands in Atari BASIC, but the examples will work with little or no modification in almost any version of BASIC.

Multiple Branches With ON-GOSUB

Suppose you are writing a game program, and you want to move a shape in one of four directions around the screen. You might, typically, convert the keyboard input so that if a cursor key is pressed, the program assigns a variable different values representing the corresponding direction. The variable may be set to 1 when you press cursor up, 4 when you press cursor right, and so forth. Similarly, you might convert joystick input to a series of numeric values indicating directions.

In this case, you might have a separate subroutine to handle movement in each direction. A single ON-GOSUB statement can handle all the branches, directing execution to the proper subroutine. Here is a short program that demonstrates the multibranching feature of ON-GOSUB. When it prompts you for a number, enter a value from 1 to 4.

```
10 PRINT "ENTER NUMBER: "
   ;:INPUT D
20 PRINT "D=";D;": ";
30 ON D GOSUB 40,50,60,70
   :GOSUB 80:GOTO 10
40 PRINT "CAME TO LINE 40
   : ";:RETURN
50 PRINT "CAME TO LINE 50
   : ";:RETURN
60 PRINT "CAME TO LINE 60
   : ";:RETURN
70 PRINT "CAME TO LINE 70
   : ";:RETURN
80 PRINT "CAME TO LINE 80
   . ":RETURN
```

When you run this program, it asks you to enter a number. If you enter 1, the program displays the message *Came to line 40.* After it returns from the subroutine at line 40, notice that the program does not proceed to the routines in lines 40–70. Instead, it proceeds to the next BASIC statement in the line, GOSUB 80. This statement is always performed, allowing you to note the difference between ON-GOSUB and a normal GOSUB command.

Now try entering a number smaller than 1 or greater than 4. Notice how ON-GOSUB responds. In this case, the program skips all of the possible destination lines listed in the ON-GOSUB statement. ON-GOSUB does not cause any branches, and the program proceeds to the next statement (GOSUB 80). For example, if you enter 0 at the prompt, the program prints *Came to line 80.*

The Destination List

The program demonstrates some basic features which ON-GOTO and ON-GOSUB share. Both statements are followed by a list of destination line numbers. The first line number is used when the tested expression equals 1; the second line number is used when the expression equals 2, and so on. If the expression evaluates to zero, no branch is taken, and the program proceeds to the next statement.

In the simple example above, the expected number series 1-2-3-4 corresponds neatly to the needs of our program. In other cases, you might have an expression that doesn't evaluate in 1-2-3 order. Say, for instance, that your expression might produce the values 1, 3, 4, and 5 (the value 2 is missing).

Atari BASIC does not allow you to simply omit a line number from the destination list, although that does work in some other versions of BASIC. (The statement ON X GOSUB 100,,300,400,500 causes a syntax error in Atari BASIC, but it works in most other BASICs.) One solution is to create a do-nothing subroutine that consists of nothing but a RETURN statement. In the unlikely event that your program ever produces the unexpected value, the program will return without doing anything. For example, including the line 200 RETURN allows you safely to use the statement ON X GOSUB 100,200,300,400,500.

Branching With ON-GOTO

You can make multiple branches in much the same way with ON-GOTO. To see how this works, substitute GOTO for each GOSUB in line 30 of the example program, and replace each RETURN in lines 40–80 with the statement GOTO 10.

When you run the program with these changes, it branches to the same destinations as before, except that it never reaches line 80 unless you enter a value outside the range 1–4. The last command in line 30 (GOTO 10) is rendered superfluous and may be deleted.

The real difference, of course, between ON-GOSUB and ON-GOTO is in what happens after the branch occurs. In the case of ON-GOSUB, the program returns to the next BASIC statement after the ON-GOSUB statement when a RETURN is encountered. On the other hand, an ON-GOTO statement, like a regular GOTO, doesn't automatically return to the part of the program where it originated.

Priority Sifting

The basic use for ON-GOSUB and ON-GOTO, then, is to test a range of conditions and branch to any of several possible destinations. In the previous example, the condition was the value assigned to the variable D, and the range was a series of numbers from 1–4, inclusive. In addition to such basic uses, ON-GOTO and ON-GOSUB can be employed to make a series of decisions in order of priority—a technique which we'll explain with a practical example.

Suppose that you are writing a text-adventure program. In an adventure, or other simulation of real-life environments, one of the most basic problems is how to assign different properties to objects and discriminate intelligently among them. For example, say that you, as the hero or heroine of the adventure, try to pick up a castle and stuff it into a gunny sack containing other objects. To respond to this action, the program must first be able to tell what properties the castle possesses. You don't want to print an inappropriate message like *You must drop something else before picking up the castle,* because that would imply that the castle is something that can be picked up.

In a typical adventure program, an object might have any of several different properties. Some objects can be picked up, but others are immovable; some are valuable, while others are useless; some are dangerous; some can be eaten or drunk; some possess magical powers, and so forth. Certain properties exclude others, as well. If you can't pick up a castle, then it's not something which you can eat or use as a weapon, for instance. To deal sensibly with this wide range of possibilities, the program needs a subroutine that will consider certain factors in order of precedence and respond as fits the situation.

ON-GOTO and ON-GOSUB are ideally suited for this sort of work. While you could accomplish the same task with a series of IF-THEN commands, see how neatly and concisely ON-GOTO performs these tasks in the following example. In a text adventure, the program might use this routine whenever you try to pick something up.

```
700 TAKE=0:ON IMMOVE GOTO
     710:ON WEIGHT>STRENG
    TH GOTO 720:ON BURDEN
    >CAPACITY GOTO 730:TA
    KE=1:RETURN
710 PRINT "YOU CAN'T PICK
     UP A ";OBJECT$;"!":R
    ETURN
720 PRINT "THAT'S TOO HEA
    VY FOR YOU.";:ON  NOT
     INJURED GOTO 740:PRI
    NT CHR$(126);" IN YOU
    R PRESENT CONDITION."
    :RETURN
730 PRINT "YOU CAN'T CARR
    Y ALL THAT. YOU'LL HA
    VE TO DROP SOMETHING.
    ";
740 PRINT :RETURN
```

The variable IMMOVE shows whether an object can be picked up; IMMOVE equals 0 if an object is movable or 1 if it's not. Let's assume that the program sets IMMOVE appropriately before we enter this routine. If you try to pick up a castle, IMMOVE equals 1 when the program executes line 700. The first ON-GOTO statement in line 700 responds to that condition, causing a branch to line 710, which prints *You can't pick up a castle* and returns. On the other hand, if you decide to pick up something more sensible, such as a goblet or newspaper, IMMOVE will be zero, in which case no branch is taken at the first ON-GOTO.

At this point, we have established the most basic fact needed for a response—whether the object can be picked up at all. If an object can't be carried, then we needn't waste time deciding other questions such as whether you have sufficient strength to lift this particular object, or whether you already are carrying too many other things.

Let's assume that you pick up something sensible and pass the first ON-GOTO test. The next statement in line 700 happens to be another ON-GOTO statement which compares the weight of the object to your current strength, to determine whether you have enough vigor to grab it. Again, we'll assume that the variables WEIGHT and STRENGTH get assigned elsewhere in the program.

If you fail the strength test, the ON-GOTO statement diverts execution to line 720, which prints the message *That's too heavy for you.* This line also contains a secondary ON-GOTO which checks the variable INJURY to see if an injury is responsible for your inability to take the object. If so, the program prints *in your present condition* at the end of the last message. Notice the use of the logical operator NOT in this comparison. If the variable INJURED equals zero, the program branches to line 740, which simply prints a blank line and exits the routine with RETURN. (Note that the result of the NOT operator may

differ in other versions of BASIC.)

At this point, we have passed the second level of discrimination; we know that the object is both movable and light enough to pick up. The third test in line 700 tests whether you already are carrying so many objects that you can't pick up another, comparing the variables BURDEN and CAPACITY. We'll say that BURDEN represents the size of your current load, and CAPACITY indicates the maximum number of objects you can carry.

If your current burden exceeds the maximum capacity, the last ON-GOTO statement causes a branch to line 730, which advises you to drop something else before trying to grab the desired object. Only if all three conditions are met does the program allow you to pick up the object and add it to your inventory.

Notice how the logical tests are arranged in order of priority, so that we establish the most basic facts first. If the object is immovable, then there's no point in checking whether you can lift it or have room in your sack to stow it—and it would diminish the realism of the adventure to print messages about those secondary topics. Similarly, if you are too weak or injured to pick something up, then we don't care how much room is in your sack. This is quite different from the joystick-reading example mentioned earlier, where all of the possible program branches have equal weight. The ability to sift through a series of tests in order of priority is essential to complex decision making.

Emulating IF-THEN-ELSE

If you're familiar with other versions of BASIC, you may have noticed something about the ON-GOTO statements in the previous example. They operate something like an IF-THEN-ELSE structure, in that the computer continues to read additional statements in the same program line if the conditions for the first ON-GOTO are not satisfied.

In most versions of BASIC, program execution drops down to the next program line whenever the conditions for an IF statement are not fulfilled. But many newer versions of BASIC allow you to add an ELSE command to an IF-THEN structure on the same program line, so that in the event the first IF test fails, the computer goes on to perform the statements that appear after ELSE. When ELSE is followed by an additional IF-THEN construct (which may include another ELSE, in turn), you can create a single line that performs quite sophisticated logical tests.

While Atari BASIC does not support the ELSE statement, you can use ON-GOTO and ON-GOSUB to much the same effect. Even though these commands can only result in a decision whether or not to branch, they can be followed on the same program line by other BASIC statements. This is demonstrated in lines 720 and 740 of the previous example. The ON-GOTO statement in line 720 has exactly the same effect as an IF-THEN-ELSE statement.

Series Comparisons

Yet another use for ON-GOTO or ON-GOSUB is for making a series of logical comparisons, which would otherwise require a FOR-NEXT loop containing one or more IF-THEN statements. This is demonstrated in the following program. Despite its brevity, this is a complete program, which converts into Arabic equivalents Roman numerals you have entered.

```
10 DIM RN$(120),C$(1),R(6
   ):PRINT CHR$(125)
20 R(0)=1:R(1)=5:R(2)=10:
   R(3)=50:R(4)=100:R(5)=
   500:R(6)=1000
30 PRINT :PRINT "ENTER RO
   MAN NUMERALS: ";:INPUT
    RN$
40 Z=LEN(RN$):IF Z=0 THEN
    30
50 TRAP 110:L=0:S=0
60 FOR X=1 TO Z:RESTORE 1
   00:Y=-1
70 Y=Y+1:READ C$:ON C$<>R
   N$(X,X) GOTO 70
80 N=R(Y):S=S+L*(L>=N)-L*
   (L<N):L=N
90 NEXT X:PRINT "ARABIC E
   QUIVALENT: ";S+N:GOTO
   30
100 DATA I,V,X,L,C,D,M
110 PRINT CHR$(253);"ILLE
    GAL CHARACTER: ";RN$(
    X,X):GOTO 30
```

The heart of this program is the ON-GOTO command in line 70. Each Roman numeral you enter is compared to the legal characters in the DATA statement. As long as the characters don't match, the ON-GOTO command loops back to the beginning of line 70 to READ the next character from the DATA list. When there is a match, program execution proceeds to the next statement after the ON-GOTO, adding the value assigned to that numeral to the cumulative sum for the whole number.

There are two advantages to using ON-GOTO in this situation instead of a FOR-NEXT loop. First, the loop terminates as soon as the tested condition is met—no time is wasted performing meaningless tests while a FOR-NEXT loop completes its appointed rounds. (It is possible, of course, to exit a FOR-NEXT loop prematurely, but this a dangerous programming practice, since you may overflow the computer's stack and cause an error if you jump out of too many loops without performing the right number of POPs.)

Incidentally, the formula used in this program to compute Arabic equivalents for Roman numerals is a little different from the one you may have learned in school. Instead of subtracting a smaller number from a following larger number (as in IV, XL, and so on), the program subtracts the smaller number from the cummulative sum when it is followed by a larger number, and then adds the larger number. The results are the same in both cases.

Other Creative Uses

The final demonstration program exhibits a number of creative uses of ON-GOTO and ON-GOSUB. The program asks you to enter a date, and it then tells you what day of the week that date falls on. For instance, if you enter JULY followed by 4 followed by 1776, the program prints the message *JULY 4, 1776 is a Thursday*. To keep the code reasonably short, its responses are limited to dates following the calendar reform of 1752, when the modern Gregorian calendar was adopted in the English-speaking world.

This 1752 limit on date calculations is the result of the Gregorian calendar reform: To bring the calendar back into harmony with sun time so that the equinoxes and solstices would fall on their traditional dates, the day Wednesday, Septem-

ber 2, 1752 was followed by Thursday, September 14, 1752. As a result, computations that take the modern calendar back prior to that date will produce a false weekday result unless you make a specific adjustment. (The year 1752 is when England and its colonies, including the ones which later became the United States, made the change. Many European countries made the change earlier, beginning in 1582 when the Gregorian calendar system was introduced. Pope Gregory decreed that Thursday, October 4, 1582 was to be followed by Friday, October 15, 1582. For countries where the change was made on the original date, change the 639797 in line 110 to 577736.)

The same calendar reform changed the formula for calculating leap years. Under the modern Gregorian calendar, centenary years (years evenly divisible by 100) are *not* leap years unless they are also evenly divisible by 400. This creates the interesting category of *leap centuries*. This explains the length of the formula in line 90 for determining leap years.

Observe carefully how this program performs its functions, especially the ON-GOTO and ON-GOSUB commands. This example may suggest additional ways to use these commands in your own programs.

Calendar

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
OB 10  DIM MONTH$(9),DAYNAME$
       (6),MO$(2),M(12)
EN 20  M(0)=0:X=0:PRINT CHR$(
       125)
BB 30  X=X+1:ON M(X-1)<>31 GO
       SUB 50:ON M(X-1)=31 GO
       SUB 40:ON X=8 GOSUB 50
       :ON X<12 GOTO 30:GOTO
       60
BE 40  M(X)=30:RETURN
BB 50  M(X)=31:RETURN
LH 60  PRINT :PRINT "Month na
       me: ";:INPUT MONTH$:TR
       AP 60:PRINT "Day: ";:I
       NPUT DAY:PRINT "Year:
       ";:INPUT YEAR
CE 70  RESTORE 190:X=0
NB 80  X=X+1:ON X>12 GOTO 160
       :READ MO$:ON MO$<>MONT
       H$(2,3) GOTO 80:M=X
80 90  LEAP=(INT(YEAR/4)=YEAR
       /4)-(INT(YEAR/100)=YEA
       R/100)+(INT(YEAR/400)=
       YEAR/400):M(2)=28+LEAP
AB 100 ON DAY>M(M) GOTO 170
AH 110 DAYS=INT((YEAR-1)*365
       .2425):FOR X=0 TO M-1
       :DAYS=DAYS+M(X):NEXT
       X:DAYS=DAYS+DAY:IF DA
       YS<639797 THEN 180
EI 120 RESTORE 200:X=0:WEEKD
       AY=DAYS-INT(DAYS/7)*7
       :IF WEEKDAY=0 THEN WE
       EKDAY=7
JI 130 X=X+1:READ DAYNAME$:O
       N X<WEEKDAY GOTO 130
IA 140 PRINT MONTH$;" ";DAY;
       ", ";YEAR;" is a ";DA
       YNAME$;"day."
DF 150 GOTO 60
CH 160 PRINT "What month is
       ";MONTH$;"?":ZANY=ZAN
       Y+1:ON ZANY<2 GOTO 60
       :PRINT "Let's get ser
       ious!":GOTO 60
AC 170 PRINT MONTH$;" only h
       as ";M(M);" days.":ON
        M<>2 OR DAY<>29 GOTO
        60:PRINT YEAR;" is n
       ot a leap year.":GOTO
       60
CL 180 PRINT :PRINT "This da
       te was prior to the a
       doption ofthe modern
       (Gregorian) calendar.
       ":GOTO 60
LG 190 DATA AN,EB,AR,PR,AY,U
       N,UL,UG,EP,CT,OV,EC
GB 200 DATA Mon,Tues,Wednes,
       Thurs,Fri,Satur,Sun @
```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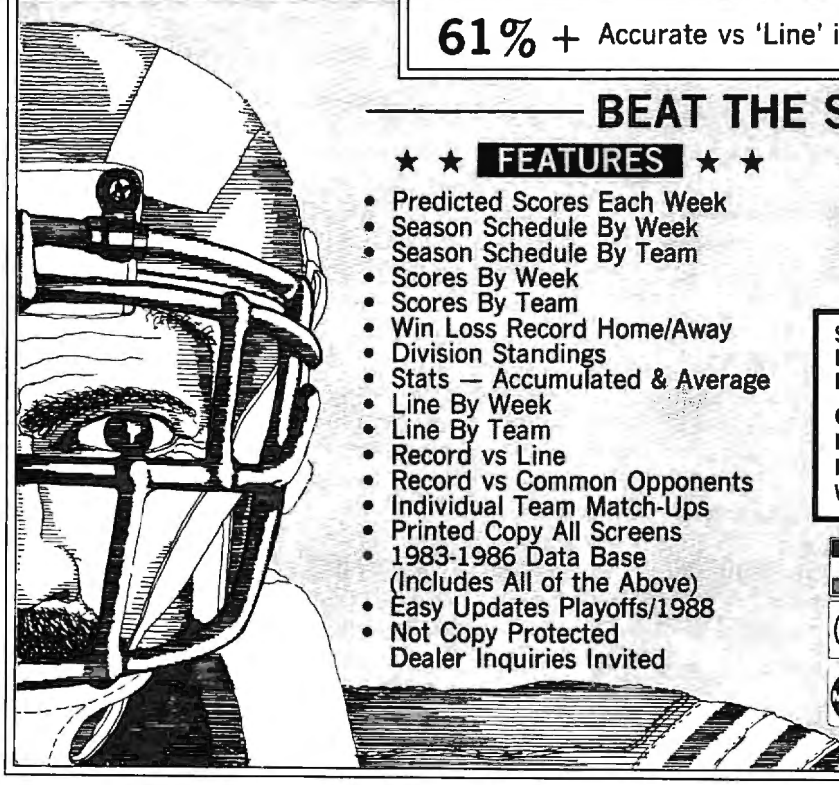

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Chaining Programs In Applesoft BASIC

Richard J. Kaufman

By appending a few lines to Applesoft BASIC programs, you can cause them to call each other and still keep their variables intact.

When a BASIC program gets so large that it exhausts all available memory, you have very few options. If you try to make the program more memory-efficient, the first step is usually to delete the REMarks; but this can prove a disaster when you come back to the program six months later. Even the best programmers forget the details of old programs, and can benefit from a few reminders. You can also split the program in two and save all the shared variables in a disk file, which the second program can read and use. This is slow at best. The old DOS manual shows a CHAIN command, which is just what you need in these situations. Unfortunately, CHAIN works only with Integer BASIC, which is no longer supported by Apple. Most high-level languages provide some means to call another program that does not remain memory resident, and include a means of passing variables. Applesoft BASIC, alas, does not. It's too basic.

There is a way, however, to chain (transfer control between) Applesoft programs, leaving the first program's variables and arrays intact. It requires an understanding of how Applesoft handles memory, and a little experimentation, but it will greatly increase the amount of BASIC code you can run at one session. Even if memory size is not a problem, you may find several small, modular programs easier to deal with than one huge one.

Table 1: Applesoft Pointer Locations

Pointer Location		Name	Description
Hex	Decimal		
$67 $68	103 104	TXTTAB	Start of program (usually $0801).
$69 $6A	105 106	VARTAB	Start of simple variable space.
$6B $6C	107 108	ARYTAB	Start of array space.
$6D $6E	109 110	STREND	End of variable space.
$6F $70	111 112	FRETOP	Start of string space.

Inside Applesoft BASIC

Table 1 summarizes the pairs of memory locations that tell BASIC where to find the program, its variables, arrays, and strings.

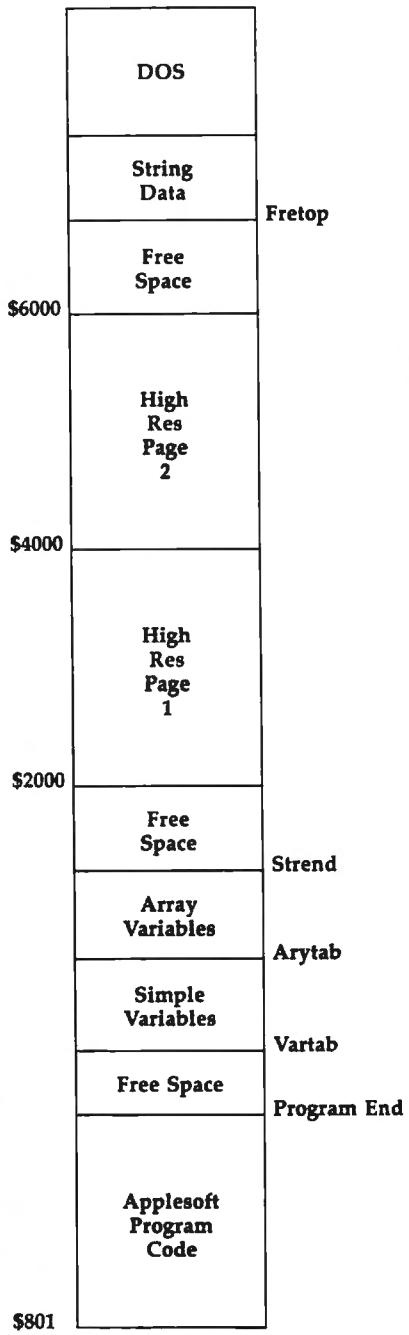
VARTAB, the start of simple variable space, usually begins right after the program text itself. However, it can be set to any desired value using the LOMEM command. This is the key to our chaining technique. Imagine that a program—which we'll call FIRST—has issued a command to run a second program named SECOND:

```
PRINT CHR$(4);"RUN SECOND"
```

When SECOND loads at TXTTAB (location $0801), it overwrites the previous contents of BASIC program memory, including at least part of FIRST. Assume that the program text for SECOND is shorter than the text of FIRST. In this case, the variable space is not yet destroyed, and it will not be until SECOND starts to use its variables. The figure helps you to visualize what is happening.

If SECOND sets VARTAB, ARYTAB, STREND, and FRETOP to the values in effect when FIRST was exited, all of FIRST's variables will be available to SECOND. The only exceptions are strings that were assigned values by literal statements in FIRST—for example, A$="THIS IS A STRING"—rather than by an INPUT statement, a disk read, or another string operation. Such strings must be reassigned. This is because of the way Applesoft handles string variables. The entry for a string variable in the variable table doesn't actually con-

Applesoft Memory Organization



tain the text of the string. Instead, it contains a pointer holding the address of the string's text. The text of strings assigned by INPUT or created by some string operation will be stored in the tables above FRETOP. However, for strings with literal assignments, the variable table entry will point to the literal statement in the program text. When another program is chained, the program text containing the literal definition will be overwritten, but the variable table entry will still point into the program text area. Thus, the string assignment is no longer valid.

There is a way to avoid this problem. Literal strings involved in string operations such as concatenation are given definitions in the string pool above FRETOP, even if the string isn't actually changed. Thus, if you replace the literal string definition A$="THIS IS A STRING" with A$="THIS IS A STRING" + "", the string definition will be preserved after chaining. Adding (concatenating) an empty (null) string to the literal assignment will cause a copy of the string definition to be created in the string pool above FRETOP.

Implementing An Applesoft Chain

The need to chain BASIC programs often is brought about by the use of high-resolution graphics. Program space starts at $0801, and hi-res graphics page 1 starts right in the middle of the program space, at $2000. Translated to decimal, this leaves a mere 6144 bytes for the program. You can use hi-res page 2 for graphics (it starts at $4000), but suppose you need both high-resolution screens for some special effects? Program 1 shows how to cause an Applesoft program to load at any desired location in memory. (Starting the program above hi-res page 2 will give you more room, unless you use many large arrays or lots of strings.)

Line 5 of Program 1 is the key to this technique. This line can be appended at the beginning of any program you wish. Note that the variable LOC is set to the one location beyond the last byte of hi-res screen 2. This is fine if you want the program to load at that location. Otherwise, set LOC to the address of the location where you want your program to start. Of course, if you're not doing graphics, you can leave the program loading address alone.

Line 6 sets LOMEM, the bottom of variable storage, to location 34817. This gives you 10,241 bytes of program text space above hi-res screen 2. The optimum value for LOMEM will be determined by the longest program to be chained. You can estimate this by examining a catalog of the programs to be chained.

To calculate the approximate length of a program, multiply the number of sectors shown in the catalog entry for the program by 256 for DOS 3.3 or by 512 for ProDOS. For instance, a program that occupies four sectors when saved under DOS 3.3 is about 1024 (4 * 256) bytes long. A four-sector program saved under ProDOS will be about 2048 (4 * 512) bytes long. A more precise method is to check the difference between the values of VARTAB and TXTTAB after loading the longest program in the chain and use that value. The following line shows how to do this:

```
PRINT (PEEK(105) + 256 * PEEK(106)) -
  (PEEK(103) + 256 * PEEK(104))
```

Once you've determined the program length, add that value to the program load address to get the minimum value for LOMEM.

In practice, it's usually easiest to start with 35000 for LOMEM and adjust the value if you find that you have memory problems. If you are not using both graphics screens, you can use a much lower value for LOMEM, but this is not likely to be necessary unless you are using a lot of array space.

Lines 10–30 of Program 1 assign a literal value to a string, use that string in a concatenation operation, print it, accept a numeric value for the variable X, and assign the value 9999 to Y.

We now are ready to save the program pointers, a task which is done in lines 900–910. The top of hi-res page 1 is 16383. We work down from there, putting the pointer bytes into the top of the screen. They do not show up on the screen, since they are nondisplayed "slack bytes." If you are not doing graphics, and you need to chain, you may have to find some other safe place to store your pointers. Perhaps you can use space in one of the DOS buffers or else find some unused space in low memory. If waiting for the extra time required doesn't bother you, the pointers can even be saved to a file. Line 920 runs Program 2.

Lines 5 and 6 of Program 2 retrieve the program pointers stashed by Program 1. Lines 10–40 then print the strings and variables

assigned in Program 1. As you can see from looking at the output, the literal string assigned in line 10 of Program 1 didn't make it. The string table points to the location where the string resided in Program 1's text, but that area of memory now contains Program 2's text. It's necessary to reassign a value to the string. However, line 15 of Program 2 shows that the involving the literal string in a string operation—as in line 15 of Program 1—will create a string that can be successfully chained.

Remember, strings entered from the keyboard or from disk files will not need resetting, while those initialized with data statements will need to be reinitialized.

You can continue chaining from program to program. Just keep saving and retrieving the pointers.

For instructions on entering these programs, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

Program 1: First

```
7E 5 LOC = 24576 + 1: IF PEEK (1
     Ø3) + PEEK (1Ø4) * 256 < >
     LOC THEN POKE LOC - 1,Ø: PO
     KE 1Ø3,LOC - INT (LOC / 256
     ) * 256: POKE 1Ø4, INT (LOC
      / 256): PRINT CHR$ (4)"RUN
      PROGRAM 1"
47 6 LOMEM: 34817
92 1Ø E1ND$ = "THIS IS PROGRAM 1
     "
9B 15 E2ND$ = E1ND$ + ""
8E 2Ø PRINT "STRING = ";E1ND$
A9 3Ø PRINT "ENTER A NUMBER, X "
     : INPUT X:Y = 9999
9B 99 REM STORE POINTERS AT END
     OF HIGH-RES SCREEN 1
FB 9ØØ POKE 16383, PEEK (1Ø5): P
      OKE 16382, PEEK (1Ø6): PO
      KE 16381, PEEK (1Ø7): POK
      E 16380, PEEK (1Ø8): POKE
       16379, PEEK (1Ø9): POKE
      16378, PEEK (11Ø)
DB 91Ø POKE 16377, PEEK (111): P
      OKE 16376, PEEK (112)
BE 92Ø PRINT CHR$ (4);"RUN PROGR
      AM 2"
97 93Ø END
```

Program 2: Second

```
57 5 POKE 1Ø5, PEEK (16383): POK
     E 1Ø6, PEEK (16382): POKE 1
     Ø7, PEEK (16381): POKE 1Ø8,
      PEEK (16380)
2E 6 POKE 1Ø9, PEEK (16379): POK
     E 11Ø, PEEK (16378): POKE 1
     11, PEEK (16377): POKE 112,
      PEEK (16376)
78 1Ø PRINT "STRING =[";E1ND$;"]
     "
8A 15 PRINT "STRING =[";E2ND$;"]
     "
DJ 2Ø E1ND$ = "THIS IS PROGRAM 2
     "
84 3Ø PRINT "X = ";X;" Y = ";Y
FE 4Ø PRINT "STRING = ";E1ND$; ©
```

The 128's CHAR Statement

Jim Butterfield, Associate Editor

In this article, associate editor Jim Butterfield examines the highly versatile but quirky CHAR statement in the Commodore 128's BASIC 7.0.

The CHAR statement of BASIC 7.0 can display characters on any type of screen—in 40 or 80 columns, text or high resolution. Whatever you have, CHAR will deliver the message. But the statement has its own special quirks, and at least one bug. This article explores CHAR in detail.

The format of the CHAR statement is described in the *Commodore 128 System Guide* as follows:

CHAR *color source*, x, y, string, *rvs*

The parameters shown in italics are optional. As a more easily understood example, this statement prints the word HELLO in column 9 of row 4:

```
CHAR ,9,4,"HELLO"
```

We'll describe all of CHAR's parameters later in this article.

Terminology

It's customary to call the high-resolution screen a *graphics* screen, and call the normal display screen a *text* screen. This can be confusing, since the 128's character set contains both text (letters, numerals, and so on) and what you might call graphics—special symbols such as hearts or diamonds. To prevent confusion, we'll use the term *bitmapped* to describe the high-resolution screen and *character* to designate the conventional text screen.

Supplying Values

CHAR always requires that you specify the column and row where printing will occur. Remember that the rows and columns are numbered starting at 0 rather than 1. Thus, if you want to print at what you might ordinarily consider column 10, row 5, use column and row values of 9 and 4.

On the 40-column screen, the row value must not be greater than 24 and the column value must not exceed 39. This is true for both character and bitmapped modes. On the 80-column screen, the column and row values must fit within the currently defined output window. If you haven't set a window, the default output window occupies the whole screen. When you're working in 80 columns, a GRAPHIC statement switches CHAR's output over to the bitmapped screen. In this case, GRAPHIC 5 (return to 80 columns) alone won't bring it back; you must cancel the bitmapped screen with GRAPHIC 0:GRAPHIC 5 (or with GRAPHIC CLR, which eliminates the bitmapped screen altogether).

Partly because of this confu-

sion, and partly because of a bug described later, I don't like to use CHAR on the 80-column screen. I'd much rather PRINT cursor-movement characters followed by the text I want to appear.

Color Source, Foreground, And Background

The first parameter in a CHAR statement is the color source. This value is optional. If you're in character mode (not high resolution), the number is ignored. If you are in bitmapped mode, a value of 0 selects the background color for printing, and a value of 1 selects the foreground color. Most programmers omit this parameter, which defaults to the foreground value (1).

It's hard to explain in words what it means to print in background and foreground colors. We'll do it the clearest way, with an example. From the 40-column screen, type this statement and press RETURN:

```
GRAPHIC 2
```

You'll end up with a lot of clutter on the upper part of the screen, but that's intentional in this case (it could be prevented with GRAPHIC 2,1). Now change the color scheme by typing these statements:

```
COLOR 0,5
COLOR 1,3
FOR J=7168 TO 7407:POKE J,48:NEXT J
```

(If you make a typing mistake, the 128 will drop out of bitmapped mode to display the appropriate error message. Entering another GRAPHIC 2 statement will get you back.)

The two COLOR statements set distinctive colors that you'll recognize when they crop up in unexpected places. Note that the COLOR 0,5 statement (the 0 specifies the background color source) sets the background to purple only on the character screen. The bitmapped screen is not affected at all. The COLOR 1,3 statement sets the foreground color to red. However, nothing appears to happen when we issue this statement or continue to type. It's odd that background affects only the character screen, and foreground, as it turns out, applies only to the bitmapped screen.

The FOR-NEXT loop sets the foreground and background colors on the first six rows of the bitmapped screen. I've chosen the colors cyan and black, and you'll see these colors sweep through the screen clutter as the loop executes. When we POKE colors, we use the color code 3 for cyan and the color code 0 for black. The value to POKE is computed as 3 * 16 + 0. If we were using a BASIC 7.0 statement such as COLOR, the corresponding color codes we'd use would be increased by 1: 4 for cyan and 1 for black.

Now we're ready to see exactly how the color code value works. Enter these lines:

```
CHAR 1,2,2,"TESTING"
CHAR 0,3,3,"MORE TESTS"
```

The screen colors were originally cyan on black. The first CHAR statement prints in a new foreground color (red) without changing the black background. The second CHAR statement prints in the original foreground color (cyan), but changes the background to the same color as the character screen background (purple). To change both, print twice with a different color source each time. Here's an example using a loop:

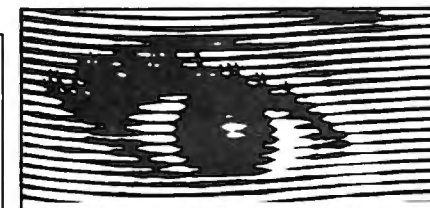
```
FOR J=0 TO 1:CHAR J,4,4,"HERE ARE
  BOTH COLORS":NEXT J
```

The rest of this article will skip the first parameter, assuming that the default value (1) will do the appropriate job.

Reverse Flag

If the reverse flag (*rvs* in the statement format shown above) is set to 0 or is omitted, the characters will print in the usual way—foreground color on background color. Setting the reverse flag to 1 (as in CHAR ,9,9,"GREETINGS",1) doesn't exactly reverse the color usage. Instead, it prints reversed characters. This is a fine point, and it may not make a difference in your case. But if you examine the various color combinations outlined in the previous section, you'll see that there is a difference.

You might like to repeat the above exercises, using an extra ,*1* at the end of each CHAR statement. You'll find that you get new combinations: black letters against a red background, and purple letters against a cyan background.



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Text Versus Graphics Mode

When you're in character mode, the rules are pretty simple. Whatever print mode the computer is in—lowercase/uppercase or uppercase/graphics—will be the mode used for the output of CHAR.

You can change modes during a CHAR display. Enter NEW and GRAPHIC CLR and then try this:

```
CHAR ,20,20,CHR$(142)+"HELLO"
  +CHR$(14)+"THERE"
```

For the 40-column screen, the entire screen makes the switch from uppercase/graphics to lowercase/uppercase mode. The 80-column screen can have both character sets displayed at the same time.

CHAR for the bitmapped screen seems at first to support only the graphics character set. But it can easily be made to support both. Try this:

```
GRAPHIC 2,1
CHAR ,10,10,CHR$(142)+"LOOK"
  +CHR$(14)+"HERE"
```

You may go back and forth between character sets, using CHR$(14) and CHR$(142), as often as you like. But you can't use programmed cursor movements or other control characters; the two just named are the only ones supported for CHAR usage on bitmapped screens. There is, however, an extra gimmick you can use on bitmapped screens. We'll talk about it, and give a program example, in a moment.

The Bug

When you use the CHAR statement on an 80-column screen, an error in the 128's logic causes two locations high in bank 0 to be changed. Bank 0 is where BASIC program text is kept. Your program won't be hurt unless it's very big (at least 38K in size)—but CHAR will corrupt a program that reaches the danger spot.

The problem is easy to get around. Just don't use the CHAR statement to print messages to the 80-column screen.

At the time of writing, Commodore is preparing a revised operating ROM for the Commodore 128. This new ROM may eliminate the bug. To test whether the bug exists on your machine, enter and run the following short program:

```
200 GRAPHIC CLR
210 BANK 0
220 POKE 54784,0
230 POKE 54785,0
240 CHAR ,1,1,"NOW TRY THIS"
```

If you have only a 40-column monitor, add the following two lines:

```
100 PRINT CHR$(27);"X"
300 PRINT CHR$(27);"X"
```

Do not add these lines if you are working in 80 columns. After you've run the program, check the contents of the two locations you POKEd to 0. You should still be set for bank 0, so just type:

```
PRINT PEEK(54784)
PRINT PEEK(54785)
```

If the values have changed from 0, your 128's ROMs have the bug. In the case of a very long BASIC program, those two locations might contain part of a line, in which case the 80-column version of the CHAR statement would corrupt two bytes of your program. Stay away.

Special Feature

When the 128 is in bitmapped graphics mode, there's an extra gimmick that CHAR can use. The character set can be switched to one that you create yourself. Normal printing to the screen won't be affected; only those characters produced by the CHAR command. Location 4588 ($11EC) controls this feature.

The address of the character set used by CHAR is kept in location 4588, which normally holds the value 208. That's a page number; multiply it by 256 and you get the address of the 128's character ROM, starting at location 53248 in the bank 14 configuration.

To create a custom character set, you don't have to design all the characters of the alphabet, plus numbers, punctuation, and so on. In the example given below, we define only three characters: one to replace the letter *A*, and the other two for *B* and *C*.

We'll replace these three letters with pictures of little people. They must fit into the space a single character occupies, so they will be quite small. If you want bigger pictures, it's not hard to hook together two or more characters so that they jointly depict some object.

As we switch from one character to another, using the CHAR command, the figures will be displayed in slightly different postures. They will look as though they are convulsing.

The procedure is simple. First, lines 110–160 POKE the new character descriptions into memory. The new character set starts at location 2816, but we skip character 0 (which would occupy the eight bytes from 2816 to 2823) and start with character 1, the letter *A*. After we've defined the new *A*, *B*, and *C*, we do some initial printing to the graphics screen (lines 170–200), and then switch the character set at line 210. The POKE to location 4588 does this job.

Lines 220–280 print the convulsing figures. You can change the rate at which the figure changes by pressing one of the number keys. Pressing any nonnumeric key causes the program to exit from this loop. The original character set is restored in line 290.

If you want to use this feature in your own programs, remember that the computer expects to find the custom character set in bank 14. That means you will usually want to set it up at an address below 16384, since bank 14 can't see RAM above that address.

```
EQ 110 FOR J=2824 TO 2847
SG 120 READ X$:POKE J,DEC(X$)
QS 130 NEXT J
MX 140 DATA 18,18,FF,18,3C,3C,
       66,81
MK 150 DATA 98,D8,7F,18,3C,3D,
       67,80
JH 160 DATA 19,1B,FE,18,3C,BC,
       E6,01
XA 170 S=100:GRAPHIC 1,1
MB 180 CHAR ,8,3,"A CHORUS LIN
       E"
JS 190 CHAR ,7,7,"(PRESS ANY K
       EY)"
BG 200 CHAR ,5,9,CHR$(14)+"(KE
       YS 1-9 FOR SPEED)"
BM 210 POKE 4588,11
FP 220 DATA AAAAA,BBBBB,AAAAA,
       CCCCC
DH 230 IF F$="CCCCC" THEN REST
       ORE 220
MK 240 READ F$
JB 250 CHAR 1,12,5,F$
AP 260 FOR J=1 TO S:NEXT J
JP 270 GET X$:IF X$="" GOTO 23
       0
AJ 280 IF X$>="0" AND X$<="9"
       [SPACE]THEN S=(10-VAL(X
       $))*25:GOTO 230
GE 290 POKE 4588,208
XR 300 GRAPHIC CLR
```

Comparing BASIC Programs

P. Kenneth Morse

This compact utility for the IBM PC/PCjr and compatibles compares two BASIC programs line by line, reporting any differences between the two files.

If you program in BASIC on MS-DOS/PC-DOS machines, it's not uncommon to find that you have two or more copies of a BASIC program with similar filenames. How can you tell for certain which is the most recent copy? DOS provides a utility called COMP.COM, but this program reports differences in the files in terms of offsets to mismatched bytes—not particularly useful information for BASIC programmers.

"COMPARE.BAS" compares two BASIC programs even if they are of different lengths, reporting any lines in one program that are not duplicated in another. It generates a complete printout of lines that are not the same in both line number and content. The program is written for IBM BASICA. It should run without modification in PCjr Cartridge BASIC, GW-BASIC, or other PC-compatible BASICs.

Enter the program and save a copy before you run it. Also before running the program, make sure that the two programs you wish to compare are saved in ASCII (nontokenized) format. To save a program in ASCII format, append ,*A* to the end of a normal SAVE command. For example, the command SAVE *"PROGRAM"*,A saves the file named PROGRAM in ASCII form.

When you run the program, it prompts you to enter the filespec (drive, path, and filename) for each of the two files you wish to compare. At the same time, make sure that your printer is turned on and ready to print. If you have a second drive or a RAMdisk, you can speed up the comparison by placing the files on separate drives.

COMPARE.BAS

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
PJ 100 'Copyright 1987
PL 110 'Compute! Publications, I
       nc.
LC 120 'All Rights Reserved.
BA 125 CLS
CP 130 PRINT TAB(30);"Copyright
       1987"
BC 140 PRINT TAB(25);"Compute! P
       ublications, Inc."
IJ 150 PRINT TAB(28);"All Rights
        Reserved."
ON 160 PRINT:PRINT
MB 190 LINE INPUT "File name of
       #1 is ",FILE$(1)
AA 200 LINE INPUT "File name of
       #2 is ",FILE$(2)
GI 210 OPEN FILE$(1) FOR INPUT A
       S #1
DL 220 OPEN FILE$(2) FOR INPUT A
       S #2
FF 230 LPRINT "File comparison:
        [1] = ";FILE$(1);"      [
       2] = ";FILE$(2)
JC 240 LPRINT
IE 250 GOSUB 400: IF L1$="Ø" THE
       N 330
II 260 GOSUB 420: IF L2$="Ø" THE
       N 390
NH 270 IF L1$=L2$ THEN 250
KB 280 L1=VAL(L1$): L2=VAL(L2$)
NJ 290 ON SGN(L1-L2) + 2 GOTO 31
       Ø,350,370
FI 300 ' Lower line number in fi
       le 1
PH 310 LPRINT "[1] ";L1$: GOSUB
       400: IF L1$ <> "Ø" THEN 2
       70
EN 320 LPRINT "[2] ";L2$
DO 330 GOSUB 420: IF L2$ <> "Ø"
       THEN 320 ELSE CLOSE: END
FC 340 ' Same line number in bot
       h files
AF 350 LPRINT "[1] ";L1$: LPRINT
        "[2] ";L2$: GOTO 250
HF 360 ' Lower line number in fi
       le 2
JK 370 LPRINT "[2] ";L2$: GOSUB
       420: IF L2$ <> "Ø" THEN 2
       70
CH 380 LPRINT "[1] ";L1$
DB 390 GOSUB 400: IF L1$ <> "Ø"
       THEN 380 ELSE CLOSE: END
IM 400 IF EOF(1)=Ø THEN LINE INP
       UT#1,L1$ ELSE L1$="Ø"
MA 410 RETURN
GO 420 IF EOF(2)=Ø THEN LINE INP
       UT#2,L2$ ELSE L2$="Ø"
ME 430 RETURN
```

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News & Products

Life Simulation

Life Simulation 100 is a program which simulates the possible consequences of various choices made in real life. It is based on the ripple theory to show how a decision will affect a person's life throughout his or her lifetime. *LS100* uses mathematical probabilities and actuary tables instead of artificial intelligence to create the what-if scenarios.

Thomas Life Systems designed the program for use in school, career, and personal decision making. Its purpose is to help individuals, especially high school and college students, anticipate how decisions may affect them in the future.

Life Simulation 100 runs on the IBM PC and any compatible which supports Microsoft BASIC.

The suggested retail price is $95. Support, updates, and registration are also available for $95 per year. School discounts are available.

Thomas Life Systems, 17408 NE 19th, Bellevue, WA 98008

Circle Reader Service Number 200.

Two Disk Managers

Lassen Software has released two IBM PC disk managers. *Diskette Manager Plus, Version 1.1* automatically reads the directory from the disk and prepares a catalog. Each catalog can store information from up to 200 disks and is updated each time a disk is read. Reports using the information from the catalog can also be generated.

With *Diskette Manager Plus*, you can also print labels that contain the name of the disk, creation date, number of files, amount of disk space remaining, and up to eight lines of comments.

Diskette Manager II performs the same functions as *Diskette Manager Plus*, and it creates a database from the catalog. You can use the wildcard function, cross-reference disks, and print the results to screen.

Both disk library managers require an IBM PC, AT, XT, or compatible with 80-character display, 128K RAM memory, PC-DOS 2.X or 3.X, and two double-sided disk drives or one double-sided and one fixed drive. To print labels, a dot-matrix printer that prints eight lpi and 16 or 17 cpi is required.

Diskette Manager Plus has a price of $59.95, and *Diskette Manager II* is $79.95. An upgrade from *Plus* to *II* is available for $20. Neither disk is copy-protected.

Lassen Software, P.O. Box 1190, Chico, CA 95927

Circle Reader Service Number 201.

What Happened The Day You Were Born?

Any one born since 1901 can find out what was happening in the world on his or her birthdate with *Time Scrolls*. This database application is contained on two 400K disks and runs on the Macintosh. Using the program, you can print out the birthdate information in a scroll format, designing your own scrolls or using those on the disk. For each date you choose, you'll see the person's name, day of the week, news events for that day, news events for that year, and three other people born on the same day. There is also entertainment information such as who won an Oscar, consumer prices for that date and the present, sports news, and political information.

Time Scrolls requires a Macintosh 512, Plus, SE, or Mac II with external drive. The program is hard-disk compatible and is not copy-protected. It also requires a LaserWriter or an ImageWriter printer.

Retail price for the program is $29.95. California residents add $1.80 for sales tax. Optional preprinted forms are also available for $20 for 100 forms.

Accurate Computer Search, 993 "C" S. Santa Fe, Dept. P, Vista, CA 92083

Circle Reader Service Number 202.

Business Software For The Mac

You can be the CEO of a company in the electronic industry with Venture magazine's *Business Simulator* for the Macintosh. This game simulates the day-to-day activities and strategic planning of a large corporation. You start out with $500,000 in capital and complete control over all decision making and resources. The object is to reach $1 billion in sales over 25 years. A business journal provides information on the economy, competition, and the market. You can use the program for what-if analyses and forecasting with no risk.

Retail price of the program is $69.95. *Business Simulator* is distributed by Electronic Arts.

Reality Technologies, 3624 Market St., Philadelphia, PA 19104

Circle Reader Service Number 203.

Toy Shop Price Reduction

Brøderbund has reduced the price of its critically acclaimed *The Toy Shop* to $39.95 for the Commodore 64 version. Users of this program can customize and print out designs for 20 mechanical models, paste the designs to cardstock, and then cut out and assemble models such as an antique truck and jet plane.

Brøderbund Software, 17 Paul Dr., San Rafael, CA 94903-2101

Circle Reader Service Number 204.

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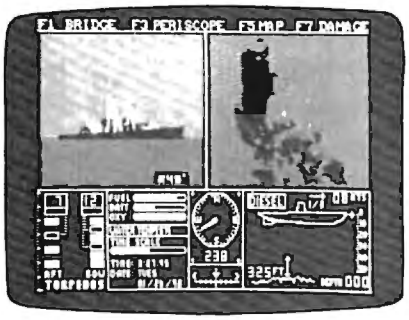

Up Periscope!, *a World War II submarine simulation from ActionSoft.*

patrol. Your targets include freighters, tankers, troop ships, destroyers, and battleships. The fleet-class sub is equipped with Mark 10 and Mark 18 torpedoes, surface and attack radars, a variable-power periscope, complete instrument panel, and ocean charts.

Up Periscope! is available on disk only and requires one disk drive and either a monochrome or a color monitor.

Retail price is $29.95.

ActionSoft, 201 W. Springfield Ave., Ste. 711, Champaign, IL 61820
Circle Reader Service Number 205.

Alien Action Game

Energy is the most important commodity in Firebird's *The Sentry.* In this new game, the player and a robot try to defeat the Sentry and her Landgazers by absorbing their alien energy while at the same time maintaining their own energy levels. Once the player becomes ruler of the landscape, he or she moves on to another of the 10,000, three-dimensional landscapes for more advanced play.

The Sentry is available for the Commodore 64. The package includes a booklet, quick-key guide, and a pin-on button. The suggested retail price is $39.95.

Firebird Licensees, P.O. Box 49, Ramsey, NJ 07446
Circle Reader Service Number 206.

ST Products From MichTron

MichTron has released several new products for the Atari ST. *GoldRunner* is a futuristic game in which humanity deserts Earth and searches for another inhabitable planet. However, to reach a new planet, you must battle the Tritons of the Ring Worlds, a highly technical and violent race. Your computer is your companion, giving instructions as you go. Graphics and an original music score are other features of this game.

Retail price for *GoldRunner* is $39.95.

GFA-Vector is a three-dimensional graphics program to be used with the *GFA BASIC* interpreter. Using this program, you can create objects using coordinates or the graphics editor and then add the objects to other programs. The pictures are created in machine language for speed and can be revolved along the axes in one-degree increments. You can store up to 32 objects in one picture file.

GFA-Vector is available for $49.95 and requires the GFA-BASIC interpreter.

Make It Move is a graphics animation program designed for use with a paint program to create screen movement. The program is controlled by the mouse and is compatible with paint programs such as *NEOchrome* and *DEGAS.* You move predrawn objects from one picture to another using the objects program. With the script function, you can display the graphics and pictures in a sequence, cutting, fading, repeating the object, or scrolling it over another object.

Retail price for *Make It Move* is $49.95.

Twenty-one different utility programs are combined into one package with *STuff.* This package includes utilities such as a GEM-program autoboot, caps-lock key lock, a file security program, a text file search utility, hexadecimal display for binary data and program files, date and time set for selected files, disk-write speed-up, and four utilities for the auto folder programs.

STuff has a retail price of $39.95.

MichTron, 576 S. Telegraph, Pontiac, MI 48053
Circle Reader Service Number 207.

IBM Educational Software

Gamco Industries has released two new educational packages for the IBM PC. *Telling Time* combines an arcade with drills in learning to tell time. Students choose from four different time-telling lessons and four levels of difficulty. They have three tries to answer each problem correctly before the correct answer is displayed. At the end of the lesson, the student receives a performance summary and, if he or she scored a certain percentage, plays an arcade game.

The teacher can change the number of problems in a lesson and the percentage needed to play the game. The program holds up to 200 students names and their scores.

In *Money,* there are also four different lessons with four difficulty levels. The lessons in this package deal with money—pennies, nickels, dimes, quarters, and half-dollars. If the student achieves a set percentage of correct answers, he or she has the opportunity to play an arcade-style game.

Teachers can store up to 200 students' names and print all or individual files.

The IBM versions of both *Telling Time* and *Money* require a graphics card and 256K memory. Versions are also available for the Commodore 64 and Apple II series with 48K. Backup disks and class packages are also available.

Retail price for all versions is $44.95.

Gamco Industries, Box 1911, Big Spring, TX 79721
Circle Reader Service Number 208.

PC Accelerator

Prism Electronics has announced an accelerator board for the IBM PC XT and compatibles. PC-Bandit does not require an expansion slot and resides in the PC's current 8284 clock-chip position. A lead is then connected to the DMA chip and another lead is connected to the motherboard for software speed selection. The board uses software instead of a switch to toggle between speeds.

A disk can be formatted using the accelerated mode, and the mode does not interfere with the realtime clock.

PC-Bandit can boost the PC's processing speed by up to 60 percent. An additional 8 megahertz can be purchased for a total boost of 280 percent.

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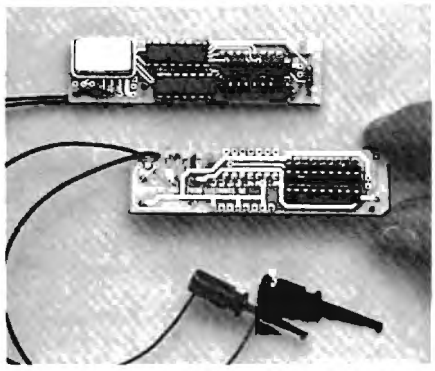

PC-Bandit from Prism Electronics.

There are two versions of PC-Bandit—7.4 MHz for the 150 nanosecond chip machines and a slower, 6.7 MHz for machines with 200 nanosecond chips.

Installation takes about 30 minutes unless the 8284 is soldered in place, in which case assistance may be necessary.

Retail price is $69.95. The 8MHz boost retails for an additional $19.95.

Prism Electronics, 14682 NE 95th St., Redmond, WA 98052
Circle Reader Service Number 209.

More Aegis Amiga Software

To add to Aegis' line of Amiga software such as the *Aegis Images* paint system and the *Aegis Sonix* music and MIDI software, the company also has introduced *Diga!*, desktop communications software for VT-52, VT-100 and Tektronix terminal emulation and for telecommunications at 300, 1200, or 2400 baud; and the *Amiga Desktop Design System*, composed of *Aegis Draw Plus* design software for the Amiga used with the Roland DXY-980 or DXY-880 series plotter.

Aegis Development, 2115 Pico Blvd., Santa Monica, CA 90403
Circle Reader Service Number 210.

New Action Software

Paragon Software's first entertainment package, *Master Ninja: Shadow Warrior of Death*, is a graphics-intensive action game for IBM PCs and compatibles available immediately and this fall for Commodore 64, Amiga, and Atari ST computers ($29.95–$34.95).

The company also has an accounting package for the Commodore 128, *Cash In-Cash Out* ($69.95), and plans to have more computer games available in late 1987 and early 1988.

Paragon Software, Plymouth Center, 521 Plymouth St., Greensburg, PA 15601
Circle Reader Service Number 211.

Avalon Hill's *Darkhorn, NBA*

With *Darkhorn*, Avalon Hill provides both strategic and arcade action in a high-fantasy setting as up to four players challenge the Darklord's dominance of the world. The game is available for Apple II and Commodore machines, and is priced at $30.

Licensed by the National Basketball Association, Avalon Hill's *NBA* is an animated, statistical basketball package that provides players with the chance to recreate 20 historical teams, with rosters including Larry Bird, Wilt Chamberlain, Michael Jordan, and Bob Cousey. The game can be played solitaire, two-person, or in autoplay mode. It is available for Commodore, the Apple II family, and PC compatibles for $39.95.

The Avalon Hill Game Co., 4517 Hartford Rd., Baltimore, MD 21214
Circle Reader Service Number 212.

Amiga Expansion

For the Amiga, Byte By Byte has announced a $99.95 powerful solid modeling and ray-tracing image production package, *Sculpt 3-D*; the Advantage 500, an Amiga memory expansion system that comes with 512K of RAM, and is user expandable to two megabytes of RAM ($249–$599, depending on amount of RAM); and the PAL JR, a two-slot, fully Zorro compatible autoconfigure expansion system and 20-meg hard disk for the Amiga, priced at $1,495.

Byte By Byte, Arboretum Plaza II, 9442 Capital of Texas Highway North, Suite 150, Austin, TX 78759
Circle Reader Service Number 213.

Apple *PrintMaster Plus*

The new Apple version of the *PrintMaster Plus* printing and graphics package has been announced by Unison World. Priced at $49.95, the package is also available as an update for $15 to current users of *PrintMaster, Print Shop, Stickybear Printer*, or similar programs.

Unison World, 2150 Shattuck Ave., Suite 902, Berkeley, CA 94704
Circle Reader Service Number 214.

Low-Cost Educational Programs

For $8.99 each, Vision Software offers a variety of budget-priced educational programs for PC-compatible, Apple, and Commodore 64 computers. The collection of programs, an educational series that's been used in the Arkansas school system, includes math, English grammar and composition, geography, and many other topics.

Vision Software, 5400 Taylor Rd., Suite 108, Naples, FL 33942
Circle Reader Service Number 215.

Tandy Expansion

This company offers a variety of user-installable expansion boards for the Tandy 1000, 1000SX, and 3000 PC-compatible computers; the latest board is a Hayes-compatible 1200-baud internal modem for $129.

Zuckerboard/ATD, 235 Santa Ana Ct., Sunnyvale, CA 94086
Circle Reader Service Number 216.

Budget Entertainment Software

In addition to a growing line of budget—$9.95 range—entertainment software, Constellation Software has announced *Quiet Riot: The Silencer*, an earphone system for Commodore computers including Amiga. The earphones are being advertised as "Mom's Delight."

Constellation Software, 1300 N. Hagan St., Champaign, IL 61820
Circle Reader Service Number 217.

Passport Supports PC Music

Passport has announced three programs supporting IBM's new PC Music Feature, an eight-voice FM sound synthesizer and MIDI interface on a single card for under $500. The programs include *MIDIsoft Studio* ($149.95), a 32-track MIDI sequencer; the *Passport MIDI Voice Editor* ($149.95), a music editor; and

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Passport Designs, 625 Miramontes St., Half Moon Bay, CA 94019
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Byte Size Software

This new company's Byte Size line of low-cost applications software is targeted to meet specific consumer needs, with each package designed to do one thing well and to be easy to use. Initial products, available for PCs and compatibles, will include such programs as *Business Graphics, Word Processor, Stock Portfolio, Telecommunications, Labeler, Home Inventory, Calculator, Time Keeper,* and more.

Software Resources International, 1209 W. Knickerbocker Dr., Sunnyvale, CA 94087
Circle Reader Service Number 219.

IBM Programs On The ST

Avant-Garde Systems has introduced *pc-ditto*, a software package that allows IBM PC software to run on the Atari 520ST and 1040ST computers. The $89.95 program features up to 703K usable memory (with 1040ST), is not copy-protected (hard disk installable), supports 3½-inch 80-track formats and an optional 5¼-inch 40-track drive, imitates monochrome and color graphics adapters, and provides adjustable palette colors.

The company states that *pc-ditto* enables an ST to run virtually all of the major IBM programs, such as *Lotus 1-2-3, Multiplan, Symphony, Flight Simulator, Dollars & Sense, Sidekick, DAC Easy Accounting, Turbo Pascal,* and many others.

Avant-Garde Systems, 381 Pablo Point Dr., Jacksonville, FL 32225
Circle Reader Service Number 220.

AwardWare From Hi Tech

Hi Tech Expressions has introduced *AwardWare*, a $14.95 design and printing package for the creation of awards, certificates, letterheads, ribbons, tickets, coupons, checks, and other printed items. The program has 20 graphics, 20 graphic borders, unlimited text borders, five seals, and five fonts.

The program is available for IBM PCs and compatibles, the Apple II family (64K minimum), the Commodore 64, and the Atari XL and XE computers. A color graphics adapter and 256K are necessary to run the program's animation function on the IBM and compatibles. A dot-matrix printer is required.

Hi Tech Expressions, 1700 N.W. 65th Ave., Suite 9, Plantation, FL 33313
Circle Reader Service Number 221.

Amiga Image Capture

NewTek has announced the release of *Digi-View 2.0*, a major upgrade of the company's color image capture system for the Amiga 500, 1000, and 2000 computers.

The $199.95 program uses advanced graphics routines and dithering techniques to display images with up to 4096 colors at once in resolutions to 640 × 400. The *Digi-View* system works with any home color or black-and-white video camera, using NewTek's three-color filter wheel system to emulate a broadcast video camera. The package captures 21 bitplanes, or over two million colors.

New features include support of all resolution modes, the new enhanced hold and modify mode for increased color resolution, and compatibility with the new Amiga 500 and 2000 computers.

NewTek, 115 West Crane St., Topeka, KS 66603
Circle Reader Service Number 222.

Thesaurus For MS-Word 3.0

Users of *Microsoft Word 3.0* on the Macintosh now have access to a 28K desk accessory thesaurus. The *Merriam Webster Thesaurus for Microsoft Word 3.0* runs only with *Microsoft Word 3.0* and contains 45,000 whole root words with up to 1.4 million combinations of synonyms. All the root words are listed with definitions. The virtual cross-referencing feature enables a user to continuously cross-reference from one synonym to another. When a synonym is located, it is automatically inserted into the text.

Retail price for the desk accessory thesaurus from Target Software is $59.95.

Target Software has also upgraded *MacLightning* to include the Merriam Webster *Ninth New Collegiate Dictionary.* There are two versions of this upgrade—*Mentor* and *Mentor Plus*—both of which contain an abridged version of the *Merriam Webster Ninth New Collegiate Dictionary.* This 100,000-word electronic dictionary occupies approximately one megabyte and requires a hard disk drive.

Mentor Plus also includes the 75,000-word *Merriam Webster Pocket Dictionary* with definitions. It is designed for desktop publishing and large word processing use.

Retail price for *Mentor* is $99.95, and the upgrade is available for $25. *Mentor Plus* retails for $199.95 and the upgrade is available for $100. The upgrades are available for *MacLightning*, which retails for $99.95.

Target Software, 14206 SW 136th St., Miami, FL 33186
Circle Reader Service Number 223.

Power Up! Products

Organize all your addresses into one file and then print out an address book with Power Up!'s *Pocket Address Book.* Each entry may contain a name, two phone numbers, a company name, a two-line address, city, state, zip code, a profession, and a comment; each entry can also be listed and sorted by name, company, or profession.

With the program, you can print out by any of the categories in the form of an address book, rotary-file cards, labels, and envelopes. Envelopes and mailing labels can be sorted by name or zip code.

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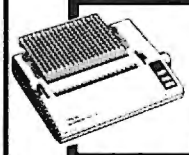

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one time or move, swap, combine, or clear whole columns. The sort option helps you reformat your report to choose the correct form. The screen shows the report as it will print out.

There are built-in math functions so you can perform calculations without entering the formulas. A pop-up calculator sends the results to any location in the report.

Pocket Address Book and *Financial Reporter* run on the IBM PC, Compaq, and compatibles with 256K memory. The printer must be able to print at 15 to 17 cpi.

Retail price for the address book is $59.95 and $49.95 for *Financial Reporter*. Both have a 30-day money-back guarantee and are available only from the Power Up! catalog.

Power Up! Catalog, Channelmark Corporation, P.O. Box 7600, 2929 Campus Dr., San Mateo, CA 94403

Circle Reader Service Number 224.

Amiga Spelling Checker

LexCheck, a spelling-checking program for the Amiga, works with *Textcraft, Scribble!, Notepad*, and ASCII text files. The master dictionary contains over 100,000 words, and there are auxiliary dictionaries that enable you to add your own words. *LexCheck* is disk-based and uses less than 100K of RAM, so you can run it with your word processor. This spelling checker recognizes proper names, place names, and technical terms.

LexCheck requires *Workbench* 1.2. Retail price is $42.95.

Complete Data Automation, P.O. Box 1052, Yreka, CA 96097

Circle Reader Service Number 225.

Mystery Reading Program From Mindplay

Students in grades two through eight can use clues and intuitive thinking to write their own solutions to 60 mystery stories in *Ace Detective*. This educational program is designed to help improve reading comprehension, cause-and-effect reasoning, and creative writing skills. The players visit the scene of the crime, interview witnesses, and check mug shots to determine the motive, opportunity, means, and suspect. Players must read and draw conclusions to get search warrants and to print out mug shots of the suspects.

New mysteries can be created using the story-builder feature which has over 60 mug-shot graphics and a telephone directory. The *Challenge Upgrade* option includes sound, time, level, text speed, story selection, story creation, and performance summaries.

The teacher's software package includes a disk, a backup, a teacher's guide and a user's guide. It is available for the Apple II series, including the IIGS.

The home edition is priced at $39.99, the teacher's edition at $49.99, and a six-disk lab pack is available for $120.

Mindplay, 82 Montvale Ave., Stoneham, MA 02180

Circle Reader Service Number 226.

Your Family History On Disk

All About Us helps you record your family and personal records. It contains many entries where you can fill in information such as birthdates, memorable events, geneology, estate planning, personal loans, and medical history. You can enter information on as many family members as you wish and then print out the information on individuals or groups.

The software package includes a 220-page user's guide, a glossary of terms, a keyboard template, and an appendix on wallet-sized cards.

All About Us runs on the IBM PC, XT, AT, and compatibles with 192K DOS 2.0 or 256K DOS 3.0. An 80-column printer is optional.

The price of the package is $60.

IlliNet Software, 123 Mumford Hall, 1301 W. Gregory Dr., Urbana, IL 61801

Circle Reader Service Number 227.

New Adventure/ Simulation Game

Pirates! combines the action of an adventure game with battle and sailing simulations to recreate the seventeenth-century pirating era. Players travel throughout the Caribbean, taking part in land battles, ship duels, and sword fights. Actual sailing experiences are simulated by changing weather conditions and the characteristics of early barques, sloops, frigates, and galleons. There's also the constant threat of mutiny and panic.

Play takes place in six different time periods from 1560 to 1680. Players take the roles of English, French, Dutch, or Spanish pirates; the expeditions of Francis Drake, Piet Heyn, and Henry Morgan are also recreated. Difficulty of the game varies so beginners and advanced players are challenged.

Pirates! is stored on both sides of a 5¼-inch floppy disk for the Commodore 64.

Suggested retail price is $39.95.

Microprose Software, 120 Lakefront Dr., Hunt Valley, MD 21030

Circle Reader Service Number 228.

Arcade Adventure For Commodore 64/128

Cauldron is a new, two-part adventure game from Brøderbund consisting of *Cauldron* and *Cauldron II*. In *Cauldron*, you are a witch queen whose broom has been stolen by the pumpking. In *Cauldron II*, you play the part of a pumpking warrior trying to destroy the witch queen. The object in both games is to collect ingredients for a magic potion to brew in the cauldron. Along the way, you meet spiders and skeletons plus a host of other ghouls in over 190 different scenes.

Suggested retail price is $29.95.

Brøderbund Software, 17 Paul Dr., San Rafael, CA 94903-2101

Circle Reader Service Number 229. ©

COMPUTE!'s Author's Guide

Most of the following suggestions serve to improve the speed and accuracy of publication. COMPUTE! is primarily interested in new and timely articles on the Commodore 64/128, Atari, Apple, IBM PC/PCjr, Amiga, and Atari ST. We are much more concerned with the content of an article than with its style, but articles should be clear and well-explained.

The guidelines below will permit your good ideas and programs to be more easily edited and published:

1. The upper left corner of the first page should contain your name, address, telephone number, and the date of submission.

2. The following information should appear in the upper right corner of the first page: If your article is specifically directed to one make of computer, please state the brand name and, if applicable, the BASIC or ROM or DOS version(s) involved. In addition, *please indicate the memory requirements of programs.*

3. The underlined title of the article should be placed about ⅔ of the way down the first page.

4. Following pages should be typed normally, except that in the upper right corner there should be an abbreviation of the title, your last name, and the page number—for example: Memory Map/Smith/2.

5. All lines within the text of the article must be double- or triple-spaced. A one-inch margin should be left at the right, left, top, and bottom of each page. No words should be divided at the ends of lines. And please do not right-justify. Leave the lines ragged.

6. Standard typing paper should be used (no erasable, onionskin, or other thin paper), and typing should be on one side of the paper only (upper- and lowercase).

7. If you are submitting more than one article, send each one in a separate mailer with its own tape or disk.

8. Short programs (under 20 lines) can easily be included within the text. Longer programs should be separate listings. *It is essential that we have a copy of the program, recorded twice, on a tape or disk.* If your article was written with a word processor, we request that you include a copy of the text file on the tape or disk. If you include a copy of your article on disk, please save the article as plain text, without any special formatting characters or control codes. Most word processors provide an option for saving a document as plain ASCII text or in unformatted form. Please use high-quality 10- or 30-minute tapes with the program recorded on both sides. The tape or disk should be labeled with your name, the title of the article, and, if applicable, the BASIC/ROM/DOS version(s). Tapes are fairly sturdy, but disks need to be enclosed within plastic or cardboard mailers (available at photography, stationery, or computer supply stores). If possible, programs written in machine language or a compiled language should include source code (or an annotated disassembly if the program was written with a machine language monitor).

9. A good general rule is to spell out the numbers zero through ten in your article and write higher numbers as numerals (1024). The exceptions to this are: Figure 5, Table 3, TAB(4), and so on. Within ordinary text, however, the zero through ten should appear as words, not numbers. Also, symbols and abbreviations should not be used within text: Use *and* (not &), *reference* (not ref.), *through* (not thru).

10. For greater clarity, use all capitals when referring to keys (RETURN, TAB, ESC, SHIFT), BASIC words (LIST, RND, GOTO), and three languages (BASIC, APL, PILOT). Headlines and subheads should, however, be initial caps only, and emphasized words are not capitalized. If you wish to emphasize, underline the word; then it will be italicized during typesetting.

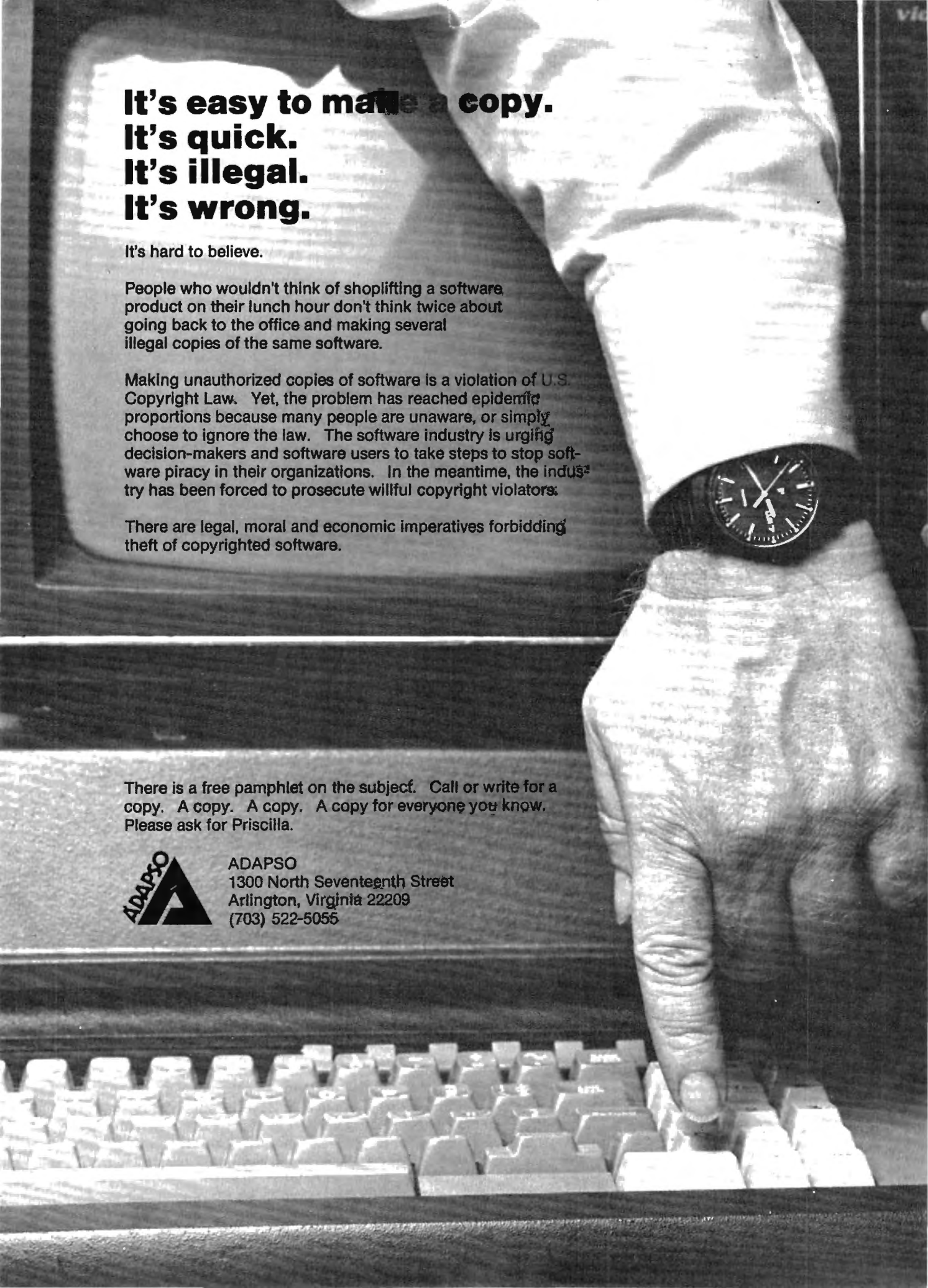
11. Articles can be of any length—from a single-line routine to a multiple-issue series. The average article is about four to eight double-spaced, typed pages.

12. We do not consider articles which are submitted simultaneously to other publishers. If you wish to send an article to another magazine for consideration, please do not submit it to us.

13. COMPUTE! pays between $70 and $800 for published articles. In general, the rate reflects the length and quality of the article. Payment is made upon acceptance. Following submission (to Editorial Department, COMPUTE! Magazine, P.O. Box 5406, Greensboro, NC 27403), it will take from four to eight weeks for us to reply. If your work is accepted, you will be notified by a letter which will include a contract for you to sign and return. *Rejected manuscripts are returned to authors who enclose a self-addressed, stamped envelope.*

14. If your article is accepted and you have since made improvements to the program, please submit an entirely new tape or disk and a new copy of the article reflecting the update. We cannot easily make revisions to programs and articles. It is necessary that you send the revised version as if it were a new submission entirely, but be sure to indicate that your submission is a revised version by writing *Revision* on the envelope and the article.

15. COMPUTE! does not accept unsolicited product reviews. If you are interested in serving on our panel of reviewers, contact the Features Editor for details.



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COMPUTE!'s Guide To Typing In Programs

Computers are precise—type the program *exactly* as listed, including necessary punctuation and symbols, except for special characters noted below. We have provided a special listing convention as well as a program to check your typing—"The Automatic Proofreader."

Programs for the IBM, TI-99/4A, and Atari ST models should be typed exactly as listed; no special characters are used. Programs for Commodore, Apple, and Atari 400/800/XL/XE computers may contain some hard-to-read special characters, so we have a listing system that indicates these control characters. You will find these Commodore and Atari characters in curly braces; *do not type the braces.* For example, {CLEAR} or {CLR} instructs you to insert the symbol which clears the screen on the Atari or Commodore machines. A complete list of these symbols is shown in the tables below. For Commodore, Apple, and Atari, a single symbol by itself within curly braces is usually a control key or graphics key. If you see {A}, hold down the CONTROL key and press A. This will produce a reverse video character on the Commodore (in quote mode), a graphics character on the Atari, and an invisible control character on the Apple.

Graphics characters entered with the Commodore logo key are enclosed in a special bracket: [<A>]. In this case, you would hold down the Commodore logo key as you type A. Our Commodore listings are in uppercase, so shifted symbols are underlined. A graphics heart symbol (SHIFT-S) would be listed as S. One exception is {SHIFT-SPACE}. When you see this, hold down SHIFT and press the space bar. If a number precedes a symbol, such as {5 RIGHT}, {6 S}, or [<8 Q>], you would enter five cursor rights, six shifted S's, or eight Commodore-Q's. On the Atari, inverse characters (white on black) should be entered with the inverse video

Atari 400/800/XL/XE

When you see	Type	See
{CLEAR}	ESC SHIFT <	Clear Screen
{UP}	ESC CTRL -	Cursor Up
{DOWN}	ESC CTRL =	Cursor Down
{LEFT}	ESC CTRL +	Cursor Left
{RIGHT}	ESC CTRL *	Cursor Right
{BACK S}	ESC DELETE	Backspace
{DELETE}	ESC CTRL DELETE	Delete character
{INSERT}	ESC CTRL INSERT	Insert character
{DEL LINE}	ESC SHIFT DELETE	Delete line
{INS LINE}	ESC SHIFT INSERT	Insert line
{TAB}	ESC TAB	TAB key
{CLR TAB}	ESC CTRL TAB	Clear tab
{SET TAB}	ESC SHIFT TAB	Set tab stop
{BELL}	ESC CTRL 2	Ring buzzer
{ESC}	ESC ESC	ESCape key

Commodore PET/CBM/VIC/64/128/16/+4

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT + ← CRSR →	
{RIGHT}	← CRSR →	
{RVS}	CTRL + 9	
{OFF}	CTRL + 0	
{BLK}	CTRL + 1	
{WHT}	CTRL + 2	
{RED}	CTRL + 3	
{CYN}	CTRL + 4	
{PUR}	CTRL + 5	
{GRN}	CTRL + 6	
{BLU}	CTRL + 7	
{YEL}	CTRL + 8	

When You Read:	Press:	See:
[<1>]	COMMODORE + 1	
[<2>]	COMMODORE + 2	
[<3>]	COMMODORE + 3	
[<4>]	COMMODORE + 4	
[<5>]	COMMODORE + 5	
[<6>]	COMMODORE + 6	
[<7>]	COMMODORE + 7	
[<8>]	COMMODORE + 8	
{ F1 }	f1	
{ F2 }	SHIFT + f1	
{ F3 }	f3	
{ F4 }	SHIFT + f3	
{ F5 }	f5	
{ F6 }	SHIFT + f5	
{ F7 }	f7	
{ F8 }	SHIFT + f7	
←	←	

key (Atari logo key on 400/800 models).

Whenever more than two spaces appear in a row, they are listed in a special format. For example, {6 SPACES} means press the space bar six times. Our Commodore listings never leave a single space at the end of a line, instead moving it to the next printed line as {SPACE}.

Amiga program listings contain only one special character, the left arrow (←) symbol. This character marks the end of each program line. Wherever you see a left arrow, press RETURN or move the cursor off the line to enter that line into memory. Don't try to type in the left arrow symbol; it's there only as a marker to indicate where each program line ends.

The Automatic Proofreader

Type in the appropriate program listed below, then save it for future use. The Commodore Proofreader works on the Commodore 128, 64, Plus/4, 16, and VIC-20. Don't omit any lines, even if they contain unfamiliar commands or you think they don't apply to your computer. When you run the program, it installs a machine language program in memory and erases its BASIC portion automatically (so be sure to save several copies before running the program for the first time). If you're using a Commodore 128, Plus/4 or 16, do *not* use any GRAPHIC commands while the Proofreader is active. You should disable the Commodore Proofreader before running any other program. To do this, either turn the computer off and on or enter SYS 64738 (for the 64), SYS 65341 (128), SYS 64802 (VIC-20), or SYS 65526 (Plus/4 or 16). To reenable the Proofreader, reload the program and run it as usual. Unlike the original VIC/64 Proofreader, this version works the same with disk or tape.

On the Atari, run the Proofreader to activate it (the Proofreader remains active in memory as a machine language program); you must then enter NEW to erase the BASIC loader. Pressing SYSTEM RESET deactivates the Atari Proofreader; enter PRINT USR(1536) to reenable it.

The Apple Proofreader erases the BASIC portion of itself after you run it, leaving only the machine language portion in memory. It works with either DOS 3.3 or ProDOS. Disable the Apple Proofreader by pressing CTRL-RESET before running another BASIC program.

The IBM Proofreader is a BASIC program that simulates the IBM BASIC line editor, letting you enter, edit, list, save, and load programs that you type. Type RUN to activate. Be sure to leave Caps Lock on, except when typing lowercase characters.

Once the Proofreader is active, try typing in a line. As soon as you press RETURN, either a hexadecimal number (on the Apple) or a pair of letters (on the Commodore, Atari, or IBM) appears. The number or pair of letters is called a *checksum*.

Compare the value displayed on the screen by the Proofreader with the checksum printed in the program listing in the magazine. The checksum is given to the left of each line number. Just type in the program a line at a time (without the printed checksum), press RETURN or Enter, and compare the checksums. If they match, go on to the next line. If not, check your typing; you've made a mistake. Because of the checksum method used, do not type abbreviations, such as ? for PRINT. On the Atari and Apple Proofreaders, spaces are not counted as part of the checksum, so be sure you type the right number of spaces between quote marks. The Atari Proofreader does not check to see that you've typed the characters in the right order, so if characters are transposed, the checksum still matches the listing. The Commodore Proofreader catches transposition errors and ignores spaces unless they're enclosed in quotation marks. The IBM Proofreader detects errors in spacing and transposition.

IBM Proofreader Commands

Since the IBM Proofreader replaces the computer's normal BASIC line editor, it has to include many of the direct-mode IBM BASIC commands. The syntax is identical to IBM BASIC. Commands simulated are LIST, LLIST, NEW, FILES, SAVE, and LOAD. When listing your program, press any key (except Ctrl-Break) to stop the listing. If you enter NEW, the Proofreader prompts you to press Y to be especially sure you mean yes.

Two new commands are BASIC and CHECK. BASIC exits the Proofreader back to IBM BASIC, leaving the Proofreader in memory. CHECK works just like LIST, but shows the checksums along with the listing. After you have typed in a program, save it to disk. Then exit the Proofreader with the BASIC command, and load the program as usual (this replaces the Proofreader in memory). You can now run the program, but you may want to resave it to disk. This will shorten it on disk and make it load faster, but it can no longer be edited with the Proofreader. If you want to convert an existing BASIC program to Proofreader format, save it to disk with SAVE *"filename"*,A.

Program 1: Atari Proofreader

By Charles Brannon

```
100 GRAPHICS 0
110 FOR I=1536 TO 1700:REA
    D A:POKE I,A:CK=CK+A:N
    EXT I
120 IF CK<>19072 THEN ? "E
    rror in DATA Statement
    s.  Check Typing.":END

130 A=USR(1536)
140 ? :? "Automatic Proofr
    eader Now Activated."
150 END
160 DATA 104,160,0,185,26,
    3,201,69,240,7
170 DATA 200,200,192,34,20
    8,243,96,200,169,74
180 DATA 153,26,3,200,169,
    6,153,26,3,162
190 DATA 0,189,0,228,157,7
    4,6,232,224,16
200 DATA 208,245,169,93,14
    1,78,6,169,6,141
210 DATA 79,6,24,173,4,228
    ,105,1,141,95
220 DATA 6,173,5,228,105,0
    ,141,96,6,169
230 DATA 0,133,203,96,247,
    238,125,241,93,6
240 DATA 244,241,115,241,1
    24,241,76,205,238
250 DATA 0,0,0,0,0,32,62,2
    46,8,201
260 DATA 155,240,13,201,32
    ,240,7,72,24,101
270 DATA 203,133,203,104,4
    0,96,72,152,72,138
280 DATA 72,160,0,169,128,
    145,88,200,192,40
290 DATA 208,249,165,203,7
    4,74,74,74,24,105
300 DATA 161,160,3,145,88,
    165,203,41,15,24
310 DATA 105,161,200,145,8
    8,169,0,133,203,104
320 DATA 170,104,168,104,4
    0,96
```

Program 2: IBM Proofreader

By Charles Brannon

```
10 'Automatic Proofreader Vers
   ion 3.0 (Lines 205,206 adde
   d/190 deleted/470,490 chang
   ed from V2.0)
100 DIM L$(500),LNUM(500):COLO
   R 0,7,7:KEY OFF:CLS:MAX=0:
   LNUM(0)=65536!
110 ON ERROR GOTO 120:KEY 15,C
   HR$(4)+CHR$(70):ON KEY(15)
    GOSUB 640:KEY (15) ON:GOT
   O 130
120 RESUME 130
130 DEF SEG=&H40:W=PEEK(&H4A)
140 ON ERROR GOTO 650:PRINT:PR
   INT"Proofreader Ready."
150 LINE INPUT L$:Y=CSRLIN-INT
   (LEN(L$)/W)-1:LOCATE Y,1
160 DEF SEG=0:POKE 1050,30:POK
   E 1052,34:POKE 1054,0:POKE
    1055,79:POKE 1056,13:POKE
    1057,28:LINE INPUT L$:DEF
    SEG:IF L$="" THEN 150
170 IF LEFT$(L$,1)=" " THEN L$
   =MID$(L$,2):GOTO 170
```

```
180 IF VAL(LEFT$(L$,2))=0 AND
    MID$(L$,3,1)=" " THEN L$=M
    ID$(L$,4)
200 IF ASC(L$)>57 THEN 260 'no
     line number, therefore co
    mmand
205 BL=INSTR(L$," "):IF BL=0 T
    HEN BL$=L$:GOTO 206 ELSE B
    L$=LEFT$(L$,BL-1)
206 LNUM=VAL(BL$):TEXT$=MID$(L
    $,LEN(STR$(LNUM))+1)
210 IF TEXT$="" THEN GOSUB 540
    :IF LNUM=LNUM(P) THEN GOSU
    B 560:GOTO 150 ELSE 150
220 CKSUM=0:FOR I=1 TO LEN(L$)
    :CKSUM=(CKSUM+ASC(MID$(L$,
    I))*I) AND 255:NEXT:LOCATE
     Y,1:PRINT CHR$(65+CKSUM/1
    6)+CHR$(65+(CKSUM AND 15))
    +" "+L$
230 GOSUB 540:IF LNUM(P)=LNUM
    THEN L$(P)=TEXT$:GOTO 150
    'replace line
240 GOSUB 580:GOTO 150 'insert
     the line
260 TEXT$="":FOR I=1 TO LEN(L$
    ):A=ASC(MID$(L$,I)):TEXT$=
    TEXT$+CHR$(A+32$(A>96 AND
    A<123)):NEXT
270 DELIMITER=INSTR(TEXT$," ")
    :COMMAND$=TEXT$:ARG$="":IF
     DELIMITER THEN COMMAND$=L
    EFT$(TEXT$,DELIMITER-1):AR
    G$=MID$(TEXT$,DELIMITER+1)
     ELSE DELIMITER=INSTR(TEXT
    $,CHR$(34)):IF DELIMITER T
    HEN COMMAND$=LEFT$(TEXT$,D
    ELIMITER-1):ARG$=MID$(TEXT
    $,DELIMITER)
280 IF COMMAND$<>"LIST" THEN 4
    10
290 OPEN "scrn:" FOR OUTPUT AS
     #1
300 IF ARG$="" THEN FIRST=0:P=
    MAX-1:GOTO 340
310 DELIMITER=INSTR(ARG$,"-"):
    IF DELIMITER=0 THEN LNUM=V
    AL(ARG$):GOSUB 540:FIRST=P
    :GOTO 340
320 FIRST=VAL(LEFT$(ARG$,DELIM
    ITER)):LAST=VAL(MID$(ARG$,
    DELIMITER+1))
330 LNUM=FIRST:GOSUB 540:FIRST
    =P:LNUM=LAST:GOSUB 540:IF
    P=0 THEN P=MAX-1
340 FOR X=FIRST TO P:N$=MID$(S
    TR$(LNUM(X)),2)+" "
350 IF CKFLAG=0 THEN A$="":GOT
    O 370
360 CKSUM=0:A$=N$+L$(X):FOR I=
    1 TO LEN(A$):CKSUM=(CKSUM+
    ASC(MID$(A$,I))*I) AND 255
    :NEXT:A$=CHR$(65+CKSUM/16)
    +CHR$(65+(CKSUM AND 15))+"
     "
370 PRINT #1,A$+N$+L$(X)
380 IF INKEY$<>"" THEN X=P
390 NEXT :CLOSE #1:CKFLAG=0
400 GOTO 130
410 IF COMMAND$="LLIST" THEN O
    PEN "lpt1:" FOR OUTPUT AS
    #1:GOTO 300
420 IF COMMAND$="CHECK" THEN C
    KFLAG=1:GOTO 290
430 IF COMMAND$<>"SAVE" THEN 4
    50
440 GOSUB 600:OPEN ARG$ FOR OU
    TPUT AS #1:ARG$="":GOTO 30
    0
450 IF COMMAND$<>"LOAD" THEN 4
    90
460 GOSUB 600:OPEN ARG$ FOR IN
    PUT AS #1:MAX=0:P=0
470 WHILE NOT EOF(1):LINE INPU
    T #1,L$:BL=INSTR(L$," "):B
    L$=LEFT$(L$,BL-1):LNUM(P)=
    VAL(BL$):L$(P)=MID$(L$,LEN
    (STR$(VAL(BL$)))+1):P=P+1:
    WEND
480 MAX=P:CLOSE #1:GOTO 130
490 IF COMMAND$="NEW" THEN INP
    UT "Erase program - Are yo
    u sure";L$:IF LEFT$(L$,1)=
    "y" OR LEFT$(L$,1)="Y" THE
    N MAX=0:LNUM(0)=65536!:GOT
    O 130:ELSE 130
500 IF COMMAND$="BASIC" THEN C
    OLOR 7,0,0:ON ERROR GOTO 0
    :CLS:END
510 IF COMMAND$<>"FILES" THEN
    520
515 IF ARG$="" THEN ARG$="A:"
    ELSE SEL=1:GOSUB 600
517 FILES ARG$:GOTO 130
520 PRINT"Syntax error":GOTO 1
    30
540 P=0:WHILE LNUM>LNUM(P) AND
     P<MAX:P=P+1:WEND:RETURN
560 MAX=MAX-1:FOR X=P TO MAX:L
    NUM(X)=LNUM(X+1):L$(X)=L$(
    X+1):NEXT:RETURN
580 MAX=MAX+1:FOR X=MAX TO P+1
     STEP -1:LNUM(X)=LNUM(X-1)
    :L$(X)=L$(X-1):NEXT:L$(P)=
    TEXT$:LNUM(P)=LNUM:RETURN
600 IF LEFT$(ARG$,1)<>CHR$(34)
    THEN 520 ELSE ARG$=MID$(A
    RG$,2)
610 IF RIGHT$(ARG$,1)=CHR$(34)
     THEN ARG$=LEFT$(ARG$,LEN(
    ARG$)-1)
620 IF SEL=0 AND INSTR(ARG$,".
    ")=0 THEN ARG$=ARG$+".BAS"
630 SEL=0:RETURN
640 CLOSE #1:CKFLAG=0:PRINT"St
    opped.":RETURN 150
650 PRINT "Error #";ERR:RESUME
     150
```

Program 3: Commodore Proofreader

By Philip Nelson, Assistant Editor

```
10 VEC=PEEK(772)+256*PEEK(773)
   :LO=43:HI=44
20 PRINT "AUTOMATIC PROOFREADE
   R FOR ";:IF VEC=42364 THEN
   [SPACE]PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VI
   C-20"
40 IF VEC=35158 THEN GRAPHIC C
   LR:PRINT "PLUS/4 & 16"
50 IF VEC=17165 THEN LO=45:HI=
   46:GRAPHIC CLR:PRINT"128"
60 SA=(PEEK(LO)+256*PEEK(HI))+
   6:ADR=SA
70 FOR J=0 TO 166:READ BYT:POK
   E ADR,BYT:ADR=ADR+1:CHK=CHK
   +BYT:NEXT
80 IF CHK<>20570 THEN PRINT "*
    ERROR* CHECK TYPING IN DATA
    STATEMENTS":END
90 FOR J=1 TO 5:READ RF,LF,HF:
   RS=SA+RF:HB=INT(RS/256):LB=
   RS-(256*HB)
100 CHK=CHK+RF+LF+HF:POKE SA+L
   F,LB:POKE SA+HF,HB:NEXT
110 IF CHK<>22054 THEN PRINT "
   *ERROR* RELOAD PROGRAM AND
   [SPACE]CHECK FINAL LINE":EN
   D
120 POKE SA+149,PEEK(772):POKE
    SA+150,PEEK(773)
130 IF VEC=17165 THEN POKE SA+
    14,22:POKE SA+18,23:POKESA+
    29,224:POKESA+139,224
140 PRINT CHR$(147);CHR$(17);"
    PROOFREADER ACTIVE":SYS SA
150 POKE HI,PEEK(HI)+1:POKE (P
    EEK(LO)+256*PEEK(HI))-1,0:N
    EW
160 DATA 120,169,73,141,4,3,16
    9,3,141,5,3
170 DATA 88,96,165,20,133,167,
    165,21,133,168,169
180 DATA 0,141,0,255,162,31,18
    1,199,157,227,3
190 DATA 202,16,248,169,19,32,
    210,255,169,18,32
200 DATA 210,255,160,0,132,180
    ,132,176,136,230,180
210 DATA 200,185,0,2,240,46,20
    1,34,208,8,72
220 DATA 165,176,73,255,133,17
    6,104,72,201,32,208
230 DATA 7,165,176,208,3,104,2
    08,226,104,166,180
240 DATA 24,165,167,121,0,2,13
    3,167,165,168,105
250 DATA 0,133,168,202,208,239
    ,240,202,165,167,69
260 DATA 168,72,41,15,168,185,
    211,3,32,210,255
270 DATA 104,74,74,74,74,168,1
    85,211,3,32,210
280 DATA 255,162,31,189,227,3,
    149,199,202,16,248
290 DATA 169,146,32,210,255,76
    ,86,137,65,66,67
300 DATA 68,69,70,71,72,74,75,
    77,80,81,82,83,88
310 DATA 13,2,7,167,31,32,151,
    116,117,151,128,129,167,136
    ,137
```

Program 4: Apple Proofreader

By Tim Victor, Editorial Programmer

```
10 C = 0: FOR I = 768 TO 768 +
   68: READ A:C = C + A: POKE I
   ,A: NEXT
20 IF C < > 7258 THEN PRINT "ER
   ROR IN PROOFREADER DATA STAT
   EMENTS": END
30 IF PEEK (190 * 256) < > 76 T
   HEN POKE 56,0: POKE 57,3: CA
   LL 1002: GOTO 50
40 PRINT CHR$ (4);"IN#A$300"
50 POKE 34,0: HOME : POKE 34,1:
    VTAB 2: PRINT "PROOFREADER
   INSTALLED"
60 NEW
100 DATA 216,32,27,253,201,141
110 DATA 208,60,138,72,169,0
120 DATA 72,189,255,1,201,160
130 DATA 240,8,104,10,125,255
140 DATA 1,105,0,72,202,208
150 DATA 238,104,170,41,15,9
160 DATA 48,201,58,144,2,233
170 DATA 57,141,1,4,138,74
180 DATA 74,74,74,41,15,9
190 DATA 48,201,58,144,2,233
200 DATA 57,141,0,4,104,170
210 DATA 169,141,96
```

©

MLX Machine Language Entry Program For Commodore 64

Ottis Cowper, Technical Editor

"MLX" is a labor-saving utility that allows almost fail-safe entry of Commodore 64 machine language programs.

Type in and save some copies of MLX—you'll want to use it to enter future machine langauge (ML) programs from COMPUTE!. When you're ready to enter an ML program, load and run MLX. It asks you for a starting address and an ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing.

If you're unfamiliar with machine language, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0–9 and the letters A–F. But don't worry—even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option.

A functions menu will appear. The first option in the menu is ENTER DATA. If you're just starting to type in a program, pick this. Press the E key, and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you left off typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

Entering A Listing

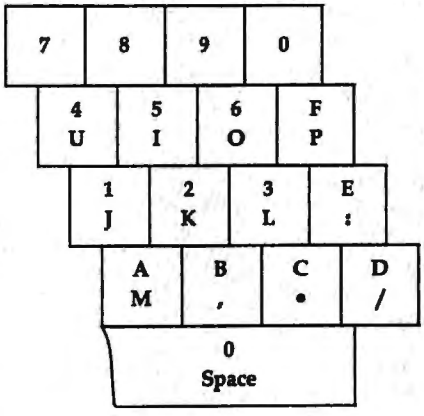
Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an MLX-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows MLX to check your typing.

When you enter a line, MLX recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if MLX detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You *do not* type spaces between the columns; MLX automatically inserts these for you. You *do not* press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit.

Only the numerals 0–9 and the letters A–F can be typed in. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, a numeric keypad is now incorporated in the listing. The keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figure below shows the keypad configuration:



MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, MLX will catch your mistake. There is one error that can slip past MLX: Because of the checksum formula used, MLX won't notice if you accidentally type FF in place of 00, and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line really badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character of data, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line number prompt.

More editing features are available when correcting lines in which MLX has detected an error. To make corrections in a line that MLX has redisplayed for editing, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. The cursor left and right keys provide the normal cursor controls. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

Display Data

The second menu choice, DISPLAY DATA, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, MLX asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. MLX displays program lines until it reaches the end of the program, at which point the menu is redisplayed. You can pause the display by pressing the space bar. (MLX finishes printing the current line before halting.) Press space again to

restart the display. To break out of the display and get back to the menu before the ending address is reached, press RETURN.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are SAVE FILE and LOAD FILE; their operation is quite straightforward. When you press S or L, MLX asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save. Don't panic; this is normal behavior. MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands. Disk users should also note that the drive prefix 0: is automatically added to the filename (line 750), so this should *not* be included when entering the name. This also precludes the use of @ for Save-with-Replace, so remember to give each version you save a different name.

Remember that MLX saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. (Tape users should bear in mind that Commodore computers are never able to detect errors during a save to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT *address*, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started MLX. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct starting and ending addresses.

The QUIT menu option has the obvious effect—it stops MLX and enters BASIC. The RUN/STOP key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, RUN/STOP-RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or any other key to return to the menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading and using the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD *"filename"*,8 for disk or LOAD *"filename"* for tape, and then RUN. Such programs will usually have a starting address of 0801 for the 64. Other programs must be reloaded to specific addresses with a command such as LOAD *"filename"*,8,1 for disk or LOAD *"filename"*,1,1 for tape, then started with a SYS to a particular memory address. On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000. In either case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

An Ounce Of Prevention

By the time you finish typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type the new MLX, and then test your copy *thoroughly* before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to ensure that you can recall your work from disk or tape. Don't let a simple typing error in the new MLX cost you several nights of hard work.

MLX For Commodore 64

```
SS 10 REM VERSION 1.1: LINES 8
      30,950 MODIFIED, LINES 4
      85-487 ADDED
EK 100 POKE 56,50:CLR:DIM IN$,
      I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
      4=254:Z5=255:Z6=256:Z7=
      127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
      :BS=PEEK(55)+Z6*PEEK(56
      ):H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}"
      :S$=" ":D$=CHR$(20):Z$=
      CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
      +23:POKE I,0:NEXT:POKE
      {SPACE}SD+24,15:POKE 78
      8,52
FC 150 PRINT"{CLR}"CHR$(142)CH
      R$(8):POKE 53280,15:POK
      E 53281,15
EJ 160 PRINT T$" {RED}{RVS}
      {2 SPACES}[8 @]
      {2 SPACES}"SPC(28)"
      {2 SPACES}{OFF}{BLU} ML
      X II {RED}{RVS}
      {2 SPACES}"SPC(28)"
      {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}
      {3 SPACES}COMPUTE!'S MA
      CHINE LANGUAGE EDITOR
      {3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADD
      RESS[4]";:GOSUB300:SA=A
      D:GOSUB1040:IF F THEN18
      0
GF 190 PRINT"{BLK}{2 SPACES}EN
      DING ADDRESS[4]";:GOSUB
      300:EA=AD:GOSUB1030:IF
      {SPACE}F THEN190
KR 200 INPUT"{3 DOWN}{BLK}CLEA
      R WORKSPACE [Y/N][4]";A
      $:IF LEFT$(A$,1)<>"Y"TH
      EN220
PG 210 PRINT"{2 DOWN}{BLU}WORK
      ING...";:FORI=BS TO BS+
      EA-SA+7:POKE I,0:NEXT:P
      RINT"DONE"
DR 220 PRINTTAB(10)"{2 DOWN}
      {BLK}{RVS} MLX COMMAND
      {SPACE}MENU {DOWN}[4]":
      PRINT T$"{RVS}E{OFF}NTE
      R DATA"
BD 230 PRINT T$"{RVS}D{OFF}ISP
      LAY DATA":PRINT T$"
      {RVS}L{OFF}OAD FILE"
JS 240 PRINT T$"{RVS}S{OFF}AVE
       FILE":PRINT T$"{RVS}Q
      {OFF}UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=
      MID$("EDLSQ",I,1)THEN A
      =I:I=5
FD 270 NEXT:ON A GOTO420,610,6
      90,700,280:GOSUB1060:GO
      TO250
EJ 280 PRINT"{RVS} QUIT ":INPU
      T"{DOWN}[4]ARE YOU SURE
       [Y/N]";A$:IF LEFT$(A$,
      1)<>"Y"THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IF
      LEN(IN$)<>4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$
      =MID$(IN$,3):GOSUB320:A
      D=AD*256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID
      $(B$,J,1):B=ASC(A$)-C4+
      (A$>"@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=
      0:A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(
      H$,B+1,1);:B=A-B*C6:PRI
      NT MID$(H$,B+1,1);:RETU
      RN
RR 360 A=INT(AD/Z6):GOSUB350:A
      =AD-A*Z6:GOSUB350:PRINT
      ";";
BE 370 CK=INT(AD/Z6):CK=AD-Z4*
      CK+Z5*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+Z5*(CK>Z7)+A
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT
      [4]";:GOSUB300:IF IN$<>
      N$ THEN GOSUB1030:IF F
      {SPACE}THEN400
EX 410 RETURN
HD 420 PRINT"{RVS} ENTER DATA
      {SPACE}":GOSUB400:IF IN
      $=N$ THEN220
JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F
```

```
        THEN PRINT IN$:PRINT"
        {UP}{5 RIGHT}";
GC 450  FOR I=0 TO 24 STEP 3:B$
        =S$:FOR J=1 TO 2:IF F T
        HEN B$=MID$(IN$,I+J,1)
HA 460  PRINT"{RVS}"B$L$;:IF I<
        24THEN PRINT"{OFF}";
HD 470  GET A$:IF A$=N$ THEN470
FK 480  IF(A$>"/"ANDA$<":")OR(A
        $>"@"ANDA$<"G")THEN540
GS 485  A=-(A$="M")-2*(A$=",")-
        3*(A$=".")-4*(A$="/")-5
        *(A$="J")-6*(A$="K")
FX 486  A=A-7*(A$="L")-8*(A$=":
        ")-9*(A$="U")-10*(A$="I
        ")-11*(A$="O")-12*(A$="
        P")
CM 487  A=A-13*(A$=S$):IF A THE
        N A$=MID$("ABCD123E456F
        0",A,1):GOTO 540
MP 490  IF A$=R$ AND((I=0)AND(J
        =1)OR F)THEN PRINT B$;:
        J=2:NEXT:I=24:GOTO550
KC 500  IF A$="{HOME}" THEN PRI
        NT B$:J=2:NEXT:I=24:NEX
        T:F=0:GOTO440
MX 510  IF(A$="{RIGHT}")ANDF TH
        ENPRINT B$L$;:GOTO540
GK 520  IF A$<>L$ AND A$<>D$ OR
        ((I=0)AND(J=1))THEN GOS
        UB1060:GOTO470
HG 530  A$=L$+S$+L$:PRINT B$L$;
        :J=2-J:IF J THEN PRINT
        {SPACE}L$;:I=I-3
QS 540  PRINT A$;:NEXT J:PRINT
        {SPACE}S$;
PM 550  NEXT I:PRINT:PRINT"{UP}
        {5 RIGHT}";:INPUT#3,IN$
        :IF IN$=N$ THEN CLOSE3:
        GOTO220
QC 560  FOR I=1 TO 25 STEP3:B$=
        MID$(IN$,I):GOSUB320:IF
         I<25 THEN GOSUB380:A(I
        /3)=A
PK 570  NEXT:IF A<>CK THEN GOSU
        B1060:PRINT"{BLK}{RVS}
        {SPACE}ERROR: REENTER L
        INE [4]":F=1:GOTO440
HJ 580  GOSUB1080:B=BS+AD-SA:FO
        R I=0 TO 7:POKE B+I,A(I
        ):NEXT
QQ 590  AD=AD+8:IF AD>EA THEN C
        LOSE3:PRINT"{DOWN}{BLU}
        ** END OF ENTRY **{BLK}
        {2 DOWN}":GOTO700
GQ 600  F=0:GOTO440
QA 610  PRINT"{CLR}{DOWN}{RVS}
        {SPACE}DISPLAY DATA ":G
        OSUB400:IF IN$=N$ THEN2
        20
RJ 620  PRINT"{DOWN}{BLU}PRESS:
         {RVS}SPACE{OFF} TO PAU
        SE, {RVS}RETURN{OFF} TO
         BREAK[4]{DOWN}"
KS 630  GOSUB360:B=BS+AD-SA:FOR
        I=BTO B+7:A=PEEK(I):GOS
        UB350:GOSUB380:PRINT S$
        ;
CC 640  NEXT:PRINT"{RVS}";:A=CK
        :GOSUB350:PRINT
KH 650  F=1:AD=AD+8:IF AD>EA TH
        ENPRINT"{DOWN}{BLU}** E
        ND OF DATA **":GOTO220
KC 660  GET A$:IF A$=R$ THEN GO
        SUB1080:GOTO220
EQ 670  IF A$=S$ THEN F=F+1:GOS
        UB1080
AD 680  ONFGOTO630,660,630
CM 690  PRINT"{DOWN}{RVS} LOAD
        {SPACE}DATA ":OP=1:GOTO
        710
PC 700  PRINT"{DOWN}{RVS} SAVE
        {SPACE}FILE ":OP=0
RX 710  IN$=N$:INPUT"{DOWN}FILE
        NAME[4]";IN$:IF IN$=N$
        {SPACE}THEN220
PR 720  F=0:PRINT"{DOWN}{BLK}
        {RVS}T{OFF}APE OR {RVS}
        D{OFF}ISK: [4]";
FP 730  GET A$:IF A$="T"THEN PR
        INT"T{DOWN}":GOTO880
HQ 740  IF A$<>"D"THEN730
HH 750  PRINT"D{DOWN}":OPEN15,8
        ,15,"I0:":B=EA-SA:IN$="
        0:"+IN$:IF OP THEN810
SQ 760  OPEN 1,8,8,IN$+",P,W":G
        OSUB860:IF A THEN220
FJ 770  AH=INT(SA/256):AL=SA-(A
        H*256):PRINT#1,CHR$(AL)
        ;CHR$(AH);
PE 780  FOR I=0 TO B:PRINT#1,CH
        R$(PEEK(BS+I));:IF ST T
        HEN800
FC 790  NEXT:CLOSE1:CLOSE15:GOT
        O940
GS 800  GOSUB1060:PRINT"{DOWN}
        {BLK}ERROR DURING SAVE:
        [4]":GOSUB860:GOTO220
MA 810  OPEN 1,8,8,IN$+",P,R":G
        OSUB860:IF A THEN220
GE 820  GET#1,A$,B$:AD=ASC(A$+Z
        $)+256*ASC(B$+Z$):IF AD
        <>SA THEN F=1:GOTO850
RX 830  FOR I=0 TO B:GET#1,A$:P
        OKE BS+I,ASC(A$+Z$):IF(
        I<>B)AND ST THEN F=2:AD
        =I:I=B
FA 840  NEXT:IF ST<>64 THEN F=3
FQ 850  CLOSE1:CLOSE15:ON ABS(F
        >0)+1 GOTO960,970
SA 860  INPUT#15,A,A$:IF A THEN
         CLOSE1:CLOSE15:GOSUB10
        60:PRINT"{RVS}ERROR: "A
        $
GQ 870  RETURN
EJ 880  POKE183,PEEK(FA+2):POKE
        187,PEEK(FA+3):POKE188,
        PEEK(FA+4):IFOP=0THEN92
        0
HJ 890  SYS 63466:IF(PEEK(783)A
        ND1)THEN GOSUB1060:PRIN
        T"{DOWN}{RVS} FILE NOT
        {SPACE}FOUND ":GOTO690
CS 900  AD=PEEK(829)+256*PEEK(8
        30):IF AD<>SA THEN F=1:
        GOTO970
SC 910  A=PEEK(831)+256*PEEK(83
        2)-1:F=F-2*(A<EA)-3*(A>
        EA):AD=A-AD:GOTO930
KM 920  A=SA:B=EA+1:GOSUB1010:P
        OKE780,3:SYS 63338
JF 930  A=BS:B=BS+(EA-SA)+1:GOS
        UB1010:ON OP GOTO950:SY
        S 63591
AE 940  GOSUB1080:PRINT"{BLU}**
         SAVE COMPLETED **":GOT
        O220
XP 950  POKE147,0:SYS 63562:IF
        {SPACE}ST>0 THEN970
FR 960  GOSUB1080:PRINT"{BLU}**
         LOAD COMPLETED **":GOT
        O220
DP 970  GOSUB1060:PRINT"{BLK}
        {RVS}ERROR DURING LOAD:
        {DOWN}[4]":ON F GOSUB98
        0,990,1000:GOTO220
PP 980  PRINT"INCORRECT STARTIN
        G ADDRESS (";:GOSUB360:
        PRINT")":RETURN
GR 990  PRINT"LOAD ENDED AT ";:
        AD=SA+AD:GOSUB360:PRINT
         D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
        ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH
        *256):POKE193,AL:POKE1
        94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
        *256):POKE174,AL:POKE1
        75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
        1050
HA 1040 IF(AD>511 AND AD<40960
        )OR(AD>49151 AND AD<53
        248)THEN GOSUB1080:F=0
        :RETURN
HC 1050 GOSUB1060:PRINT"{RVS}
        {SPACE}INVALID ADDRESS
         {DOWN}{BLK}":F=1:RETU
        RN
AR 1060 POKE SD+5,31:POKE SD+6
        ,208:POKE SD,240:POKE
        {SPACE}SD+1,4:POKE SD+
        4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
        TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
        240:POKE SD,0:POKE SD+
        1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
        KE SD+4,0:POKE SD,0:PO
        KE SD+1,0:RETURN
```

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Attention Programmers

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All the programs in this issue are available on the ready-to-load *COMPUTE! Disk*. To order a one-year (four-disk) subscription, call toll free **800-247-5470** (in IA 800-532-1272). Please specify which computer you are using.

MLX Machine Language Entry Program For Apple

Tim Victor, Editorial Programmer

To make it easier to enter machine language programs into your computer without typos, COMPUTE! is introducing its "MLX" entry program for the Apple II series. It's our best MLX yet. It runs on the II, II+, IIe, and IIc, and with either DOS 3.3 or ProDOS.

A machine language (ML) program is usually listed as a long series of numbers. It's hard to keep your place and even harder to avoid making mistakes as you type in the listing, since an incorrect line looks almost identical to a correct one. To make error-free entry easier, COMPUTE! generally lists ML programs for Commodore and Atari computers in a format designed to be typed in with a utility called "MLX." The MLX program uses a checksum system to catch typing errors almost as soon as they happen.

Apple MLX checks your typing on a line-by-line basis. It won't let you enter invalid characters or let you continue if there's a mistake in a line. It won't even let you enter a line or digit out of sequence. Best of all, you don't have to know anything about machine language to enter ML programs with MLX. Apple MLX makes typing ML programs almost foolproof.

Using Apple MLX

Type in and save some copies of Apple MLX on disk (you'll want to use MLX to enter future ML programs in COMPUTE!). It doesn't matter whether you type it in on a disk formatted for DOS 3.3 or ProDOS. Programs entered with Apple MLX, however, must be saved to a disk formatted with the same operating system as Apple MLX itself.

If you have an Apple IIe or IIc, make sure that the key marked CAPS LOCK is in the down position. Type RUN. You'll be asked for the starting and ending addresses of the ML program. These values vary for each program, so they're given at the beginning of the ML program listing and in the program's accompanying article. Find them and type them in.

The next thing you'll see is a menu asking you to select a function. The first is (E)NTER DATA. If you're just starting to type in a program, pick this. Press the E key, and the program asks for the address where you want to begin entering data. Type the first number in the first line of the program listing if you're just starting, or the line number where you left off if you've already typed in part of a program. Hit the RETURN key and begin entering the data.

Once you're in Enter mode, Apple MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight bytes and a checksum. When you enter a line and hit RETURN, Apple MLX recalculates the checksum from the eight bytes and the address. If you enter more or less than nine numbers, or the checksum doesn't exactly match, Apple MLX erases the line you just entered and prompts you again for the same line.

Invalid Characters Banned

Apple MLX is fairly flexible about how you type in the numbers. You can put extra spaces between numbers or leave the spaces out entirely, compressing a line into 18 keypresses. Be careful not to put a space between two digits in the middle of a number. Apple MLX will read two single-digit numbers instead of one two-digit number (F 6 means F and 6, not F6).

You can't enter an invalid character with Apple MLX. Only the numerals 0–9 and the letters A–F can be typed in. If you press any other key (with some exceptions noted below), nothing happens. This safeguards against entering extraneous characters. Even better, Apple MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, Apple MLX will catch your mistake.

Apple MLX also checks to make sure you're typing in the right line. The address (the number to the left of the colon) is part of the checksum recalculation. If you accidentally skip a line and try to enter incorrect values, Apple MLX won't let you continue. Just make sure you enter the correct starting address; if you don't, you won't be able to enter any of the following lines. Apple MLX will stop you.

Editing Features

Apple MLX also includes some editing features. The left- and right-arrow keys allow you to back up and go forward on the line that you are entering, so you can retype data. Pressing the CONTROL (CTRL) and D keys at the same time (*delete*) removes the character under the cursor, shortening the line by one character. Pressing CTRL-I (*insert*) puts a space under the cursor and shifts the rest of the line to the right, making the line one character longer. If the cursor is at the right end of the line, neither CTRL-D nor CTRL-I has any effect.

When you've entered the entire listing (up to the ending address that you specified earlier), Apple MLX automatically leaves Enter mode and redisplays the functions menu. If you want to leave Enter mode before then, press the RETURN key when Apple MLX prompts you with a new line address. (For instance, you may want to leave Enter mode to enter a program listing in more than one sitting; see below.)

Display Data

The second menu choice, (D)ISPLAY DATA, examines memory and shows the contents in the same format as the program listing. You can use it to check your work or to see how far you've gotten. When you press D, Apple MLX asks you for a starting address. Type in the address of the first line you want to see and hit RETURN. Apple MLX displays program lines until you press any key or until it reaches the end of the program.

Save And Load

Two more menu selections let you save programs on disk and load them back into the computer. These are (S)AVE FILE and (L)OAD FILE. When you press S or L, Apple MLX asks you for the filename. The first time you save an ML program, the name you assign will be the program's filename on the disk. If you press L and specify a filename that doesn't exist on the disk, you'll see a disk error message.

If you're not sure why a disk error has occurred, check the drive. Make sure there's a formatted disk in the drive and that it was formatted by the same operating system you're using for Apple MLX (ProDOS or DOS 3.3). If you're trying to save a file and see an error message, the disk might be full. Either save the file on another disk or quit Apple MLX (by pressing the Q key), delete an old file or two, then run Apple MLX again. Your typing should still be safe in memory.

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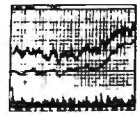

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Apple MLX: Machine Language Entry Program

For instructions on entering this program, please refer to "COMPUTE!'s Guide to Typing In Programs" elsewhere in this issue.

```
100 N = 9: HOME : NORMAL : PRIN
    T "APPLE MLX": POKE 34,2: O
    NERR  GOTO 610
110 VTAB 1: HTAB 20: PRINT "STA
    RT ADDRESS";: GOSUB 530: IF
     A = 0 THEN  PRINT  CHR$ (7
    ): GOTO 110
120 S = A
130 VTAB 2: HTAB 20: PRINT "END
     ADDRESS  ";: GOSUB 530: IF
     S >  = A OR A = 0 THEN  PR
    INT  CHR$ (7): GOTO 130
140 E = A
150 PRINT : PRINT "CHOOSE:(E)NT
    ER DATA";: HTAB 22: PRINT "
    (D)ISPLAY DATA": HTAB 8: PR
    INT "(L)OAD FILE  (S)AVE FI
    LE  (Q)UIT": PRINT
160 GET A$: FOR I = 1 TO 5: IF
    A$ < > MID$ ("EDLSQ",I,1) T
    HEN  NEXT : GOTO 160
170 ON I GOTO 270,220,180,200:
    POKE 34,0: END
180 INPUT "FILENAME: ";A$: IF A
    $ <  > "" THEN  PRINT  CHR$
     (4);"BLOAD";A$;",A";S
190 GOTO 150
200 INPUT "FILENAME: ";A$: IF A
    $ <  > "" THEN  PRINT  CHR$
     (4);"BSAVE";A$;",A";S;",L"
    ;E - S
210 GOTO 150
220 GOSUB 590: IF B = 0 THEN 15
    0
230 FOR B = B TO E STEP 8:L = 4
    :A = B: GOSUB 580: PRINT A$
    ;": ";:L = 2
240 FOR F = 0 TO 7:V(F + 1) = P
    EEK (B + F): NEXT : GOSUB 5
    60:V(9) = C
250 FOR F = 1 TO N:A = V(F): GO
    SUB 580: PRINT A$" ";: NEXT
     : PRINT : IF  PEEK (49152)
    < 128 THEN  NEXT
260 POKE 49168,0: GOTO 150
270 GOSUB 590: IF B = 0 THEN 15
    0
280 FOR B = B TO E STEP 8
290 HTAB 1:A = B:L = 4: GOSUB 5
    80: PRINT A$;": ";: CALL 64
    668:A$ = "":P = 0: GOSUB 33
    0: IF L = 0 THEN 150
300 GOSUB 470: IF F < > N THEN
    PRINT CHR$ (7);: GOTO 290
310 IF N = 9 THEN GOSUB 560: IF
     C < > V(9) THEN PRINT CHR$
    (7);: GOTO 290
320 FOR F = 1 TO 8: POKE B + F
    - 1,V(F): NEXT : PRINT : NE
    XT : GOTO 150
330 IF LEN (A$) = 33 THEN A$ =
    O$:P = 0: PRINT CHR$ (7);
340 L = LEN (A$):O$ = A$:O = P:
    L$ = "": IF P > 0 THEN L$ =
      LEFT$ (A$,P)
350 R$ = "": IF P < L - 1 THEN
    R$ =  RIGHT$ (A$,L - P - 1)
360 HTAB 7: PRINT L$;: FLASH :
    IF P < L THEN PRINT MID$ (A
    $,P + 1,1);: NORMAL : PRINT
    R$;
370 PRINT " ";: NORMAL
380 K = PEEK (49152): IF K < 12
    8 THEN 380
390 POKE 49168,0:K = K - 128
400 IF K = 13 THEN HTAB 7: PRIN
    T A$;" ";: RETURN
410 IF K = 32 OR K > 47 AND K <
     58 OR K > 64 AND K < 71 TH
    EN A$ = L$ + CHR$ (K) + R$:
    P = P + 1
420 IF K = 4 THEN A$ = L$ + R$
430 IF K = 9 THEN A$ = L$ + " "
     +  MID$ (A$,P + 1,1) + R$
440 IF K = 8 THEN P = P - (P >
    0)
450 IF K = 21 THEN P = P + (P <
    L)
460 GOTO 330
470 F = 1:D = 0: FOR P = 1 TO L
    EN (A$):C$ = MID$ (A$,P,1):
     IF F > N AND C$ < > " " TH
    EN  RETURN
480 IF C$ < > " " THEN  GOSUB 5
    20:V(F) = J + 16 * (D = 1)
    * V(F):D = D + 1
490 IF D > 0 AND C$ = " " OR D
    = 2 THEN D = 0:F = F + 1
500 NEXT : IF D = 0 THEN F = F
    - 1
510 RETURN
520 J = ASC (C$):J = J - 48 - 7
     * (J > 64): RETURN
530 A = 0: INPUT A$:A$ = LEFT$
    (A$,4): IF LEN (A$) = 0 THE
    N RETURN
540 FOR P = 1 TO LEN (A$):C$ =
    MID$ (A$,P,1): IF C$ < "0"
    OR C$ > "9" AND C$ < "A" OR
     C$ > "Z" THEN A = 0: RETUR
    N
550 GOSUB 520:A = A * 16 + J: N
    EXT : RETURN
560 C = INT (B / 256):C = B - 2
    54 * C - 255 * (C > 127):C
    = C - 255 * (C > 255)
570 FOR F = 1 TO 8:C = C * 2 -
    255 * (C > 127) + V(F):C =
    C - 255 * (C > 255): NEXT :
     RETURN
580 I = FRE (0):A$ = "": FOR I
    = 1 TO L:T =  INT (A / 16):
    A$ =  MID$ ("0123456789ABCD
    EF",A - 16 * T + 1,1) + A$:
    A = T: NEXT : RETURN
590 PRINT "FROM ADDRESS ";: GOS
    UB 530: IF S > A OR E < A O
    R A = 0 THEN B = 0: RETURN
600 B = S + 8 * INT ((A - S) /
    8): RETURN
610 PRINT "DISK ERROR": GOTO 15
    0
```

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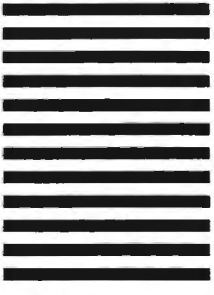

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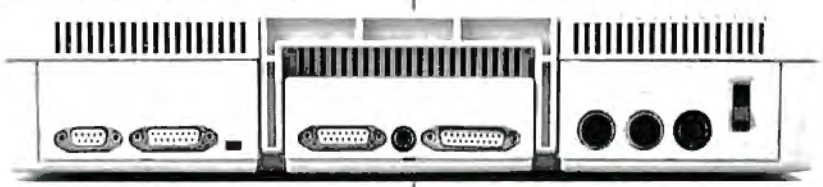

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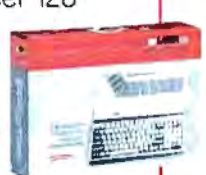

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