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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, onetrillionth 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 $0^{\circ}$ on the Kelvin temperature scale used by physicists; it's equivalent to $-459^{\circ}$ 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 $-420^{\circ}$. 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 $9^{\circ} \mathrm{F}$, 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, supercon-ductors-and chips with blindingly fast Josephson-junction integrated cir-cuits-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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## Whither The $51 / 4$ Floppy?

I read a newspaper article stating that the production of $51 / 4$-inch floppy disks will be halted. Is this true?

Richard LaBorde
Many computer manufacturers have begun to include $31 / 2$-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 $31 / 2$-inch drives for the Apple II or the Commodore 64 and 128. But this doesn't mean that $5^{1 / 4}$-inch floppy drives or disks are dead. Many recent introductions, such as the Compaq Portable III and Epson Equity I+, include 5¼inch drives. And there are over 10 million $51 /$-inch disk drives in use at this timefar 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 $31 / 2$-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 $5^{1 / 4}$ - or $3^{1 / 2}$-inch disks. It's likely that more new computers will use $3^{1 / 2}$-inch disk drives, and some suppliers of $51 / 4$-inch disks and drives may decrease production as demand slows. However, you should be able to find $51 / 4$-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 loca-
tion 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 linelength 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 1øø REM array size is number
    of words
HP 110 DIM EN$(3),SP$(3)
DO 12g REM -1 is the last data i
    tem
HC 130 READ ENGLISH$,SPANISH$
CB 14ø IF ENGLISH*="-1" THEN 18ø
```



```
    ANISH
CC 16| N=N+1: BOTO 136
IF 170 REM generic randomizer
FB 18g INPUT "Enter a number bet
    woen 1 and 9999";}
FL 19| FOR }\textrm{J}=1\mathrm{ TO X:T = RND(1):N
    EXT
AC 260 I=INT (RND(1) &N)
KJ 21ø IF NR=N THEN PRINT"all th
    - words in the list have"
    :PRINT"been displayed.":E
    ND
DK 220 IF T(I)=1 THEN 2\sigmag
HK 23ø PRINT" Spanish: ";SP舟(I
    )
BL 24ø REM delay loop
KO 25ø FOR J=1 TO 2\sigmaøø: NEXT J
DB 26g PRINT" English : ";EN*
    (I);
JI 27ø PRINT:FOR J=1 TO 2øøø:NEX
    T J
MN 28% T(I)=1:NR=NR+1:GOTO 260
OK 29ø 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 $1 / 8$-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 doublewidth 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 2 MHz 6510 chip is simply a version that is rated as capable of operating at clock speeds of up to 2 MHz ; 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 dualspeed 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 800 XL , 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:

```
1ø GRAPHICS B:POKE 71ø,\emptyset
15 COLOR 1
2ø FOR I=g TO 2\emptyset STEP 2
3\emptyset PLOT I, Ø: DRAWTO I, 2\emptyset
4| NEXT I
50 FOR I=21 TO 41 STEP 2
6\emptyset PLOT I, Ø:DRAWTO I, 2\emptyset
7@ 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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Which computer(s) do you own or use that you read COMPUTE! for?

## $\square$ Amiga

$\square$ Apple II series (II + , IIe, or IIc)
$\square$ Apple IIGs
$\square$ Atari 400/800, XL, XEAtari STCommodore 64Commodore 128MacintoshIBM PCIBM PC compatibleOther
Which of the following peripherals do you own or use with your computer?
$\square$ Hard disk driveDot-matrix printerLetter-quality printerColor printerLaser printer300 -bps modem
1200 -bps modem2400 -bps modemGraphics tablet / light penMIDI synthesizer
Video digitizer
$\square$ Other
What types of software have you purchased in the past year?
$\square$ Word processor
$\square$ Programming languageGraphics designTelecommunicationsEducation
$\square$ Games
$\square$ Busines
$\square$ Busine
$\square$ Other
$\square$ None

Which language do you prefer for programming?

## $\square$ BASIC

$\square$ Assembly/machine language

- C
$\square$ Pascal
$\square$ Modula-2
$\square$ Forth
$\square$ FORTRAN
$\square$ Logo
- Other $\qquad$
$\square$ I don't program my computer
What section of the magazine do you like most? (Please check no more than two.)
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$\qquad$

## CES and COMDEX: what computer you own.

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

Keith Ferrell, Features Editor <br> \title{
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A Tale Tale Of Of Two Two Cities
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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 po-
tential 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, at-tention-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 play-ers-with the important exception of PC compatibles manufacturersis 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 compati-
ble 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 MSDOS machines have established a permanent and growing presence to which all developers are responding. "The installed base of 64 s , 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 64 s ," 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 wideeyed 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

## 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.

Amiga, and especially to the Amiga 500 , means that the number of programs for those machines will continue to grow.

## 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 pulldown 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 MSDOS 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 512 K of memory that can be expanded to one megabyte by the user with an optional expansion card, a built-in $880 \mathrm{~K}, 3^{1 / 2}$-inch floppy disk drive, an expanded key-


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

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 Powertull 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 $880 \mathrm{~K}, 31 / 2$-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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has space for one additional halfheight PC-compatible $51 / 4$-inch disk drive and two $31 / 2$-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 $320 \times 200$ to $640 \times 400$, 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 PCCAD [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 busi-ness-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.

## Malinin Lemmanale

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 65 XE is an enhanced 64 K 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 fullblown 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 128 K of data into what was originally designed to be an 8 K 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 Mew 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 $31 / 2$-inch drive that everyone was expecting. Instead, it's a faster, higher-capacity $5^{1 / 4}$-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 ( 88 K formatted), Atari dual density ( 127 K formatted), and true double density ( 360 K 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 $31 / 2$-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 $31 / 2$-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 video-
game 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 onefourth 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.

## Connidence In Consumers

Perhaps confident that consumers are already well aware of their MSDOS 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, 512 K RAM (expandable

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#### Abstract

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 12 K or a machine language program of more than 6 K . Exceptional software which exceeds these sizes will certainly be considered.
6. Entries must be submitted on $51 / 4$-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.
10. This contest is void where prohibited by law. Full-time, parttime, 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 $\qquad$ 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.)

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Millions of Apple personal computers-from the venerable II + and IIe to the compact IIc and the powerful IIcs-are in homes, schools, and offices across the country. And Apple's Macintosh computers are showing up in more businesses, more universities, and now more homes than ever before. Apple computers are being used for almost everything-entertaining and educating people of all ages, managing home finances, running businesses, writing, painting, composing. Name something computers can do, and Apple computers do it.
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to 640 K ), a mouse, a single $51 / 4$-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-toGO!, 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 Super16 uses an 8088 chip and processes at 4.77 MHz , with 256 K RAM, a single 360 K 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 512 K 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, 512 K RAM (expandable to 768 K ), four expansion slots, two 360 K 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 onepiece system that uses $31 / 2$-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 720 K disk drive, priced at $\$ 999$; Model 2, with two 720 K 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, 512 K RAM (expandable to 640 K ), 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 $360 \mathrm{~K} 5^{1 / 4}$-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 harddisk 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 fourthquarter 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 $31 / 2$-inch 720 K disk drive, 512 K RAM, and MSDOS 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 $31 / 2$-inch 720 K disk drive, 1MB RAM, with a 80 C 86 processor that delivers clock speeds of 9.54 and 4.77 MHz . In addition to MSDOS 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 8088based, offering 512 K on the motherboard (expandable to 640 K ), three expansion slots, two $360 \mathrm{~K} 5^{1 / 4}$-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 $360 \mathrm{~K} 5^{1 / 4}$-inch disk drives; 512 K RAM (expandable to 768 K ); a graphics card capable of monochrome, Hercules, or color graphics configuration; an external color/mono switch; a full-size ATstyle keyboard; RAM-resident utilities software including menudriven 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

## НОT

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Executive Writer and Executive Filer from Paperback Software, will find strong response from consumers. "Because we've taken the trouble to design our tutorial in standard English, with color-coded disks, and because of the quality not only of the tutorial but also the DOS shell, the first-time user can plug in our machine, sit down, and let the machine itself show how it can be used. Experienced users can, of course, skip the tutorial, but take advantage of some of the advanced programming utilities we've included."

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 512 K RAM (expandable to 640 K ), 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 backedup 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 512 K RAM (expandable to 640 K ), dual speeds of 4.77 or 8 MHz switchable from the keyboard, a $51 / 4$-inch disk drive, and an expansion slot, the Laser Compact XT is priced at $\$ 599$. The XTE comes with 640 K RAM (expand-
able to 1 MB ), a built-in EGA, dual speeds of 4.77 or 10 MHz , a $51 / 4$ 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 512 K RAM (expandable to 640 K ), one 360 K disk drive, five expansion slots, and MS-DOS 3.2. The company's PC10-2 comes with two 360 K drives and 640 K 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 PC101 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, Tex-as-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 40 MB hard drive and monochrome at the low end to a 150 MB drive and EGA at the upper end.

In all configurations, the $386^{16}$ delivers a megabyte of pure static RAM, a $1.2 \mathrm{MB} 51 / 4$-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 2 MB ), a 1.2MB $51 / 4$-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 130 MB at prices ranging from $\$ 3,990$ to $\$ 7,299$.

## Soltware 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 topline 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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## Learning C: Programming Graphics on the Amiga and Atari ST <br> 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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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 fullcolor 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 onscreen 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 GEOScompatible 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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| :---: | :---: |
|  | Verbatim: |
| Activision: | SSDD ........................ $\$ 9.95$ |
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| Zork Trilogy ............... $\$ 39.95$ |  |
| GFL Football .............. $\mathbf{\$ 2 4 . 9 5}$ | 3M: |
| Leather Goddesses ..... \$24.95 | SSDD ....................... \$16.95 |
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| Microleague: | SKC: |
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| Firebird: |  |
| Golden Path | \$22.95 |
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Access:
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Tournament \#1 .......... $\$ 13.95$
10th Frame .............. $\$ 24.95$
Activision:
Champion. Baseball .... $\$ 24.95$
Champion. Basketball. $\$ 24.95$
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Paint Works
Shanghai
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Bureaucracy
Microprose:
Silent Service
F-15 Strike Eagle
Optimized Syste
Personal Pascal Personal Prolog Strategic Simula Phantasie
Phantasie II ......
Road War 2000
Colonial Conques
Epyx:
Apshai Trilogy ..
Sub Battle Simul
Super Cycle
World Games
Wrestling
Karate Champ

## Firebird

Pawn.
Starglider
Golden Path
Guild of Thieves
Tracker
VIP:
Accounts
VIP Professional
Unison World:
Art Gallery 1 or 2
Print Master
Zoom:
Zoomracks
Zoomracks I
Microleague:
Microleague Bas
General Manager

Coulw

Broderbund:
Bank St. Writer 1 Carmen San Dieg Champ. Lode Ru Graphic Lib. I, II, Karateka
Print Shop
Print Shop Comp Print Shop Paper Science Kit ..... Lode Runner Bank St. Filer Bank St. Mailer.
Access:
Leader Board
Mach 5 ..............
Mach - 128
10th Frame ........ Exec. Tournamen Tournament \#1 Triple Pack ... WId. CI. Leader Activision:
Aliens ..
Champion. Baske Hacker
Hacker 2 .............
Labyrinth ............ Music Studio ..... Tass Times ........ Titanic ................

Microprose:
F-15 Strike Eagle
Gunship .............
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 simu-
lation (\$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 newslettergeneration 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' ${ }^{\prime}$ 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 halfpipe skateboarding, hacky-sack (footbag), BMX stunt bicycle riding, surfing, roller skating, and Frisbeetype 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 IIseries 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 sci-ence-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, twotouch 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 play-er-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 latesummer 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 ( 48 K 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 Commo-


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

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. $P \mathcal{E} L$ 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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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. Fullpage 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 PostScriptcompatible 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 professionallooking 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 divisior 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 Pub-lisher-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, $i t$ 's your job to retrieve a homerun 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 512 K 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 $X E$ is a fast-action arcade game in a novel setting.


The Commodore 64 version of "Climber $5^{\prime \prime}$ 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 512 K 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/PCjir 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 somer－ sault 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 pro－ gram is written in machine lan－ guage，it must be entered with the Apple version of the＂MLX＂ma－ chine 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：
$\begin{array}{ll}\text { STARTING ADDRESS？} & 0 \mathrm{C} 00 \\ \text { ENDING ADDRESS？} & 1 \mathrm{EBF}\end{array}$
After you have entered all the data， be sure to save a copy before leav－ ing MLX．

To start the game，use a com－ mand 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 ob－ jects 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＂COMPUTEI＇s Guide to Typing In Programs＂elsewhere in this issue．

MO 1 REM COPYRIEHT 1987 COMP UTE！PUBLICATIONS，INC． ALL RIGHTS RESERVED．
AO 2 PRINT＂CCLEAR\}COPYRIGHT 1987＂：PRINT＂COMPUTE！ PUBLICATIONS，INC．＂：PRI NT＂ALL RIGHTS RESERVED ＂：？＂$\{3$ DOWN\}CREATINE FILE．＂
EC 3 FOR H＝1 TO 2355
FB 4 READ A：CK $=C K+A$ ：NEXT H
HO 5 IF CK＜ 263962 THEN PRIN T＂TYPING ERROR＂：END
OL 6 DPEN \＃ $1,8, \varnothing, " D: C 5$. OBJ＂
KE 7 RESTORE ：FOR $H=1$ TO 235 5
EX 8 READ A：PUT \＃1，$A: N E X T H$
HK 15 DATA 255，255， $0,64,251$ ， 64，32，122
ID 29 DATA $72,165,196,56,233$ ，16，141，7
LH 30 DATA $212,141,165,6,169$ ，62，141，47
IN 40 DATA 2，169，3， $141,29,20$ B，173，165
BJ 59 DATA 6，24， $195,3,133,29$ 8，169，
EJ 6 D DATA $133,297,162,5,16 \varnothing$ ， $6,169,5$
H6 7 D DATA 145，267，2øø，26B， 2 49，236，298， 292
IH Bø DATA 2ø日，242，173，165，6 ，24，165，6
PC 9ø DATA $133,298,169,28,13$ 3，2ø7，162，7
KL 1 פø DATA $142,166,6,169,9$ ， 162，20，169
EA 11 DATA 3，145，267，2øø，2ø 2，268，248，165
EF $12 \boldsymbol{1}$ DATA $2 \oplus 7,24,165,24,13$ 3，267，174，166
BF 136 DATA 6，2月2，2月日，228， 23 6，26日，169，4！
OF 140 DATA $133,267,162,8,16$ Ø， $0,185,192$
HK $15 \emptyset$ DATA 65，145，297，2øø， 2 62，268，247， 173
KP $16 \emptyset$ DATA $165,6,24,105,4,1$ 33，204，173
LI 17 DATA $165,6,24,1$ D5，5， 1 33，266， 169
HO $18 \emptyset$ DATA $\varnothing, 141,8,298,141$ ， 9，208， 141
N6 $19 \varnothing$ DATA $1 \varnothing, 2 \varnothing 8,141,11,2 \emptyset$ 8，141，8，21ø
BA $2 \emptyset \emptyset$ DATA $169,3,141,15,21 \varnothing$ ，169，134，141
LK 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，$\varnothing$
LN 240 DATA $141,197,2,169,6 \varnothing$ ，141，198，2
LA $25 \emptyset$ DATA $169, \varnothing, 141,2 \emptyset \varnothing, 2$ ， $169,19,133$
FF 26 DATA 224，169，66，133，2 $25,169,59,141$
HL 27 DATA 3，2ø8，169，Ø，141， 221，6， 141
KO 289 DATA $222,6,169,33,141$ ，111，2，162
CD 290 DATA 7，16の， $0,169, \emptyset, 15$ 3，184，6
E6 3øø DATA 2øø，2ø2，2ø8，247， $32,177,67,16 \emptyset$
OE 31 DATA $1,169,249,145,2 \emptyset$ 7，169，8，162
DO $32 \emptyset$ DATA $6,169,138,145,2 \emptyset$ 7，2øø，2øø，2øø
DJ $33 \emptyset$ DATA $2 \emptyset \emptyset, 2 \emptyset \emptyset, 252,64,2$ 47，65，2øø，2ø2
00340 DATA 298，243，169，158， $141, \varnothing, 2,169$
IE 350 DATA $68,141,1,2,169,1$ 92，141， 14
PB 36，DATA 212，169，246，162， 67，169，7，32
CO $37 \emptyset$ DATA $92,228,32,177,67$ ，169，134，141
IJ 389 DATA $168,6,32,120,67$ ， $162,6,142$
L 39 DATA $166,6,169,9,162$ ， 2ந，169，255
KG 4øø DATA 145，2ø7，2øø，2ø2， 2ø8，248，169， 120
OK 41 D DATA $141,168,6,32,126$ ，67，174，166
KO 42 D DATA 6，2ø2，2ø日，227，16 Ø，$\varnothing, 32,177$
PB 436 DATA $67,169,138,141,1$ 68，6，32，12ø
IP 445 DATA $67,169,3,141,171$ ，6，169，22
ME $45 \emptyset$ DATA $141,172,6,32,188$ ，67，32，177
PE 46 DATA $67,169,255,141,1$ $68,6,32,12 \emptyset$
J6 $47 \%$ DATA $67,169,4,141,171$ ，6，169， 16
Mr． 48 D DATA $141,172,6,32,189$ ，67，173，48
L6 490 DATA $2,24,105,41,133$ ， 2． $7,173,49$
HA 5øø DATA $2,1 \varnothing 5,4,133,2 \varnothing 8$ ， 16ø，, 162
DP $51 \emptyset$ DATA $15,185,201,65,14$ 5，2ø7，2øø，2ø2
U 52 DATA $2 ø 8,247,173,48,2$ ，24，1ø5，44
LD 530 DATA $133,218,173,49,2$ ，165，4，133
LK 54 D DATA $219,173,48,2,24$ ， 195，56， 133
KH 55 DATA $22 \emptyset, 173,49,2,105$ ，4，133，221
LD $56 \emptyset$ DATA $173,48,2,24,165$ ， 8ø，133， 222
If 579 DATA $173,49,2,195,4,1$ 33，223，76
FP 58ø DATA 198，68，24，24，6ø， 6の，6ø，6曰
II 590 DATA $69,24,24,173,165$ ，174，16，
KF $6 \emptyset \emptyset$ DATA $\varnothing, \emptyset, \emptyset, \emptyset, \varnothing, 172,16$ 5，182
IJ $61 \emptyset$ DATA $165,172,16,48,5 \varnothing$ ，37，51，51
KH $62 \emptyset$ DATA $\varnothing, 51,52,33,5 \emptyset, 52$ ，$\emptyset, 52$
CC 639 DATA $47,9,34,37,39,41$ ，46， 121
6K 649 DATA $96,121,96,81,96$ ， 81，69，72

J1 650 DATA $72,69,248,65,243$ ，66，72，72
DC 66® DATA 47，47，53，53，60，6 Ф，47，47
ED $67 \emptyset$ DATA $72,72,81,81,47,4$ 7，96，96
FM 68ø DATA 1ø日，1ø8，47，47， 12 8，128，144，144
HI 69ø DATA $121,56,124,127,1$ 2ø，124，212，192
0B 7øø DATA 23ø，96，$, 252,22 \varnothing ~$ ，92，124，1ø8
$0171 \varnothing$ DATA 1 198，72， 1 ®8，56， 12 4，127，4，124
6172 D DATA $46,62,24,28,56,2$ 48，56，56
KN $73 \varnothing$ DATA 124，1ø8，1ø日，$\varnothing$ ， ， 56，124，127
BD 74ø DATA 12ஏ，124，212，192， 230，96， 5,254
BO 75ø DATA 254，6ø，62，126， $1 \varnothing$ 2，224，192，56
If $76 \varnothing$ DATA $124,127,4,124,46$ ，62，24，28
AF 77 D DATA $56,249,57,124,12$ 6，122，96，96
BE 78ø DATA $\varnothing, 56,124,127,12 \emptyset$ ，124，212，192
0L79ø DATA 230，96， $9,120,248$ ，124，62，126
BN 日øø DATA $246,228,134,56,1$ 24，127，4，124
1081 D DATA $46,62,24,28,56,1$ 24，212，68
IE 82ø DATA $14,126,118,96,9$ ， 24，65，126
EO 830 DATA $126,126,126,126$ ， 60，69，126，255
태 840 DATA $255,255,60,126,1$ 26，126，1ø2，24
HG $85 \varnothing$ DATA $6 \emptyset, 126,6 \varnothing, \varnothing, \varnothing, \varnothing$ ， の， $6 \varnothing$
DP 86ø DATA $1 ø 2,11 \varnothing, 1 ø 2,52,3$ 6，126，126，126
EN 870 DATA 1 Ø2，56，124，124， 1 24，124，125，59
MD $88 \emptyset$ DATA $127,254,252,248$ ， 254，127，127， 127
LI $89 \varnothing$ DATA $118,112,32,56,12$ 4，124，57，1
СВ $9 \varnothing \varnothing$ DATA $\varnothing, \varnothing, 124,76,92,72$ ，11ø，79
OJ 916 DATA $127,127,118,112$ ， 32，28，62，62
0J $92 \emptyset$ DATA $62,62,19 \varnothing, 220,25$ 4，127，63，31
OK 930 DATA $127,254,254,254$ ， 11ø，14，4，28
BP 94ø DATA 62，62，156，128，ø， Ø，62，5ø
BI 95ø DATA $54,18,122,242,25$ 4，254，119，14
PD 96ø DATA 4，28，62，254，30，6 2，43，3
6C 97ø DATA 193，6，244，66，239 ，67， 6,63
EA 989 DATA 59，58，62，54，54，1 8，54，28
1099ø DATA 62，254，32，60， 116 ，124，24，56
BL 1 øøø DATA $28,31,28,28,62$ ， 54，54，$\varnothing$
BC $1 \varnothing 1 \emptyset$ DATA $\varnothing, 28,62,254,3 \varnothing$ ， 62，43，3
NF $1 \emptyset 2 \emptyset$ DATA $1 \emptyset 3,6, \emptyset, 127,127$ ，60，124，126
EH $1 ø 3 \varnothing$ DATA $1 ø 2,7,3,28,62,2$ $54,32,66$
CA $1 \varnothing 4 \varnothing$ DATA $116,124,24,56,2$ 8，159，156，62
CD 1050 DATA $126,94,6,6, \emptyset, 28$ ，62，254
NH $106 \varnothing$ DATA $3 \varnothing, 62,43,3,103$ ， 6，$\varnothing, 3 \varnothing$

OL 1 Ø7ø DATA $31,62,124,126,1$ 11，39，97，28
OF 1 198ø DATA $62,254,32,69,11$ 6，124，24，56
KN 1 ø9ø DATA $28,62,43,34,112$ ，126，110，6
D $11 \varnothing \varnothing$ DATA $\varnothing, \varnothing, 36, \varnothing, 72, \varnothing, 3$ 6，$\square$
EK 1110 DATA $72,4 \varnothing, 4 \varnothing, 37,35$ ， 35，37，4ø
FF $112 \emptyset$ DATA 42，45，47，56，53， 57，60，64
MA 1130 DATA $68,72,76,81,121$ ，96，121，81
BL 1140 DATA $121,72,165,207$ ， 24，1ø9，168，6
HC 1150 DATA $133,297,165,2 ø 日$ ，1ø5， $0,133,2 ø 8$
PL 1160 DATA $96,169,1,141,16$ 8，6，172，169
LI 117 D DATA 6，162，7，173， 213 ，6，2ø5，166
OH $118 \emptyset$ DATA $6,24 \varnothing, 23,238,16$ 6，6，2ø2，2ø8
B6 $119 \emptyset$ DATA $242,173,166,6,2$ 4，1ø5，41，141
BK $120 \varnothing$ DATA $166,6,136,208,2$ 28，169， 0,141
LP 121 DATA $168,6,96,173,48$ ，2，133，297
LJ $122 \emptyset$ DATA $173,49,2,133,2 ø$ 8，96，162，3
L6 1230 DATA $142,166,6,162,4$ ，142，167，6
6A 124 D DATA $174,171,6,169,8$ 5，145，267，169
LA 125 D DATA $6,141,168,6,32$ ， 12ø，67，2ø2
BO 126 DATA 2ø8，241，173， 172 ，6，141，168，6
BL 127 D DATA $32,12 \varnothing, 67,174,1$ 67，6，2ஏ2，2ø8

B1 1280 DATA $229,169,8 \emptyset, 141$ ， 168，6，32，12ø
AB 1290 DATA $67,174,24 \varnothing, 67,2$ 35，68，166，6
E1 $13 ø \varnothing$ DATA 2ø2，2ø8，2ø1，96， 72，138，72，152
E6 131 D DATA $72,165,224,24,1$ ஏ5，18，133， 226
AI $132 \emptyset$ DATA $165,225,1 ø 5, \varnothing, 1$ 33，227，16ø， 1
태 133 DATA $162,18,169, \varnothing, 14$ 5，293，145，2ø5
GP 134ø DATA 2ஏஏ，2ஏ2，2ø8，246 ，173，212，6，133
EL $135 \emptyset$ DATA 2ø3， $133,265,16 \emptyset$ ，$\varnothing, 162,18,177$
NL 136 D DATA $224,145,203,177$ ，226，145，2ø5，2øø
BB 1379 DATA $2 ø 2,2 ø 日, 244,173$ ，218，6，2ø1，1
PJ $138 \emptyset$ DATA 2ø日， $53,238,219$ ， 6，174，219，6
हल 139 DATA $224,4,144,5,169$ ，$\varnothing, 141,1$
NJ 14øø DATA $21 \varnothing, 224,5,144,3$ 4，169，, 141
PF $141 \varnothing$ DATA $219,6,174,220,6$ ，189，237，65
AD $142 \emptyset$ DATA $141, \emptyset, 21 \varnothing, 169,1$ 64，141，1，21ø
$06143 \emptyset$ DATA 238，220，6，174， 2 2ø，6，224，38
LA 144 D DATA $144,5,169,9,141$ ，220，6，173
LC 145 D DATA $221,6,201,1,208$ ，38，169，42
ON $146 \emptyset$ DATA $141,3,21 \varnothing, 174,2$ 22，6，189，95
06147 D DATA $67,141,2,210,23$ 8，222，6，173
LD 1480 DATA $222,6,201,19,2 \varnothing$ 8，14，169， 6

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Like an NLQ mode that makes their letters print almost as sharp as a daisy wheel．And mode switch－ ing at the touch of a button in over 160 styles．But now，a Dots－Perfect
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## 1－800－368－7737 <br> （Anywhere in the United States or Canada）

KI 149 DATA $141,222,6,141,2$ $21,6,141,3$
6 15øø DATA $21 \varnothing, 141,2,21 \emptyset, 1$ פ4，168，194，17ø
CK 151 D DATA 1 Ø4，76，98，228，7 $2,138,72,152$
BB $152 \emptyset$ DATA $72,169,1,141,1 \emptyset$ ，212，172，164
LN $153 \emptyset$ DATA $6,185,184,6,141$ ，2，208，238
LI 1540 DATA $164,6,173,164,6$ ，2פ1，7， 144
IJ 1550 DATA $5,169, \emptyset, 141,164$ ，6，1ø4，168
EJ $156 \emptyset$ DATA $1 \emptyset 4,17 \emptyset, 1 \emptyset 4,64$ ， 169，1，141， 192
LO 157 DATA $6,169,5,141,191$ ，6，141，218
PI $158 \varnothing$ DATA $6,169,16 \varnothing, 141,1$ 93，6，169，69
LB 1590 DATA $141,198,2,169, \emptyset$ ，141，2øø，2
BE $16 \emptyset \emptyset$ DATA $16 \varnothing, \varnothing, 162,20,18$ 5，217，65，145
HK $161 \emptyset$ DATA 222，2のø，236，68， 231，69，292，298
EP $162 \emptyset$ DATA $247,173,31,208$ ， 2ø1，6，2ø8，249
NK 163 DATA $16 \emptyset, \emptyset, 162,2 \emptyset, 16$ 9，$\varnothing, 145,222$
HF $164 \emptyset$ DATA 2øø，2ø2，2ø日，248 ，169， $0,173,192$
BN 165 DATA 6，24，165，16， 145 ，220，169， 174
BA 166 D DATA $141,212,6,169,2$ Øø，141，213，6
KE 1670 DATA $141, \emptyset, 2 \emptyset 8,141,1$ ，2ஏ8，169，
LC 168 D DATA $162,4,169,9,153$ ，214，6，2øø
CA 1699 DATA 2ø2，2ø8，247，16ø ， $0,162,7,169$
OK 17 øø DATA $42,153,184,6,14$ $1,2,208,169$
$\mathrm{KL} 171 \varnothing$ DATA $\varnothing, 153,194,6,153$ ，2ø4，6，2øø
BD 172 DATA 2 D2，298，236， $16 \emptyset$ ， $5,162,7,173$
NB 173 D DATA $19,21 \emptyset, 41,15,24$ ，195，4の，153
KH 174 D DATA $2 \emptyset 4,6,2 \emptyset \varnothing, 2 \emptyset 2,2$ 46，9，169， 1
60175 DATA $153,2 \emptyset 4,6,2$ のø， 2 ஏ2，2ø8，232，166
LF 176 D DATA $\emptyset, 173,191,6,24$ ， $195,16,145$
HD $177 \boldsymbol{\sigma}$ DATA $218,169,1,141,2$ $18,6,169,3$
OE 178日 DATA $141,39,298,173$ ， $15,2 ø 8,41,3$
HD 179 DATA $2 \emptyset 1, \varnothing, 24 \varnothing, 5 \emptyset, 16$ 9， $5,141, \square$
BE $18 \emptyset \emptyset$ DATA $2 \boxed{ }, 141,1,2 \emptyset 8,1$ $41,213,6,169$
OE 181ø DATA $174,141,212,6,3$ 2，4ø，72，238
LO 182 DATA $192,6,173,193,6$ ，56，233，29
PA $183 \emptyset$ DATA $141,193,6,173,1$ 98，2，1ø5，62
OL 1840 DATA $141,198,2,173,2$ Øø，2，233，78
IE $185 \emptyset$ DATA $141,29 \varnothing, 2,76,2$ ， 69，173， 14
B6 186ø DATA 2ø日，2ø1， $0,24 \varnothing, 3$ 9，173，14，208
OF 187 DATA $2 \emptyset 1,8,24 \emptyset, 32,16$ 9， $5,141,218$
KI $188 \emptyset$ DATA 6，141， $6,21 \emptyset, 141$ ，1，21ø，169
L6 189 DATA $1,141,221,6,206$ ，191，6，173
II $19 \varnothing \varnothing$ DATA $191,6,2 \varnothing 1,9,2 ø 8$ ，3，76， 198

JC 1910 DATA $68,76,12,69,169$ ，3，141，30
OH 192 DATA 2פ8，169，$\varnothing, 141,2$ פ2，6，169，36
CF 193 D DATA $141,166,232,69$ ， 227，7ø，6，162
LN 194 D DATA $7,173,212,6,295$ ，166，6，298
LL 1950 DATA $5,169,1,141,2 \emptyset 2$ ，6，173，166
LD $196 \emptyset$ DATA $6,24,1 \emptyset 5,24,141$ ，166，6，2ø2
BH 1970 DATA 298，231，169，1， 1 41，2ø3，6，141
KJ $198 \emptyset$ DATA $211,6,173,2$ 62， 6 ，2ø1，1，24ø
PF 199 DATA $3,76,169,76,169$ ，36， 141,166
KN 2øøø DATA 6，162，4，173， 212 ，6，295，166
KN 2ø1ø DATA 6，24の，15，173， 16 6，6，24， 195
В 2 Ø2の DATA $48,141,166,6,2 \emptyset$ 2，298，236，76
0J 2ø3ø DATA $117,79,169, \emptyset, 14$ 1，168，6，173
BG 2 Ø4の DATA $212,6,2 \emptyset 1,174,2$ $4 \varnothing, 13,169,77$
LN 2 25 5 DATA $141,166,6,169,3$ ，141，169，6
BL 206 D DATA $32,135,67,173,1$ 68，6，141， 211
LI $297 \emptyset$ DATA 6，169， $9,141,168$ ，6，173，212
NH 2ø8ø DATA 6，2ø1，3ø，24ø，13 ，169，53， 141
JB 2 Ø9ø DATA $166,6,169,4,141$ ，169，6，32
0121 øø DATA $135,67,173,168$ ， 6，141，293，6
LJ 211 D DATA 76，16の，7 $16,169,1$ ，141，168，6
$00212 \emptyset$ DATA $169,53,141,166$ ， 6，169，4，141
MF 2130 DATA $169,6,32,135,67$ ，173，168，6
OK 214 D DATA $141,211,6,169,7$ 7，141，166，6
MA 2150 DATA $169,3,141,169,6$ ，32，135，67
BG $216 \emptyset$ DATA $173,168,6,141,2$ ø3，6，173， $12 \emptyset$
KL 217 DATA $2,141,166,6,173$ ，2פ2，6，291
IL $218 \emptyset$ DATA $1,24 \emptyset, 3,76,74,7$ 1，173， 166
KN 219 DATA $6,201,1 \emptyset, 24 \varnothing, 14$ ，173，166，6
NF 22のø DATA $2 \emptyset 1,11,24 \emptyset, 7,17$ 3，166，6，291
FC 2210 DATA 9，298，3ø，169， 23 5，133，224，169
BF 222 DATA $66,133,225,173$ ， 213，6，2ø1，47
NJ 2230 DATA $24 \varnothing, 12,2 \emptyset 6,213$ ， 6，173，213，6
KO 224 DATA $141,9,2 \varnothing 8,141,1$ ，298，76，19
DP 225ø DATA $71,173,228,7$ ， 2 $23,71,166,6$
NN 226 D DATA $2 \varnothing 1,6,24 \emptyset, 14,17$ 3，166，6， 291
FD 227 D DATA 7，24ø，7，173，166 ，6，2ø1，5
6D 2289 DATA 298，82，169，19， 1 33，224，169，66
HG 229 D DATA $133,225,173,213$ ，6，2ø1，2ஏ9，24ø
NH 23øø DATA $12,238,213,6,17$ 3，213，6， 141
KF $231 \emptyset$ DATA $\varnothing, 298,141,1,2 \emptyset 8$ ，169， 0,141
LA 232 DATA $215,6,141,217,6$ ，172，214，6

EP 2330 DATA 165，224，24，121， 87，67，133，224
HI 234 DATA $165,225,1$ Ø5，ø， 1 33，225，238， 216
HK 235פ DATA 6，173，216，6，2ø1 ，3，2ø8，2ø
LI 2369 DATA $169, \emptyset, 141,216,6$ ，238，214，6
LI 237ø DATA $173,214,6,201,4$ ，268，5，169
KH 2389 DATA $9,141,214,6,173$ ，2ø3，6，201
LC $239 \emptyset$ DATA 1,2 ， $28,27,173,16$ 6，6，2の1，1ø
NH 24øø DATA 24ø，14，173，166， 6，2ワ1，6，24の
IC 241 DATA $7,173,166,6,291$ ，14，2ø8，6
BK 242 DATA 2 D6，212，6，76， 13 9，71， 173,211
II 243ø DATA 6，2ø1，1，2ø8，87， $173,166,6$
OA 244 D DATA $2 \emptyset 1,9,24 \emptyset, 14,17$ 3，166，6，201
IA 245 D DATA $5,249,7,173,166$ ，6，201，13
00246 DATA 2ø8，66，238，212， $6,169, \emptyset, 141$
BO 247 D DATA $214,6,141,216,6$ ，169，127，133
FI 2489 DATA $224,169,66,133$ ， 225，172， 215,6
FB 249 D DATA $165,224,24,121$ ， 91，67，133，224
HH 25 Øø DATA $165,225,1 ø 5,0,1$ 33，225，238， 217
HJ $251 \emptyset$ DATA 6，173， $217,6,2 \emptyset 1$ ，3，2ø8，2ø
LI 252 DATA $169,9,141,217,6$ ，238，215，6
LH 253ø DATA $173,215,6,2 \emptyset 1,4$ ，298，5， 169
EE 254の DATA $\emptyset, 141,215,6,162$ ，Ø，16ø， 7
012550 DATA $189,194,6,2 ø 1$ ， ，24ø，31，254
CK 256 D DATA $184,6,189,184,6$ ，2ஏ1，2ஏ9，144
CH $\mathbf{2 5 7 \emptyset}$ DATA $21,169,224,71,2$ $19,72,42,157$
HM 258 D DATA $184,6,169, \emptyset, 157$ ，194，6，173
KK 259ø DATA 1 D， 21 19，41，63， 24 ，165，1，157
AN 26øø DATA 2פ4，6，232，136， 2 ø日，214，162，$\emptyset$
LF 261 D DATA $169,7,189,194,6$ ，2פ1，1，24ø
OB 262 DATA $15,222,204,6,18$ 9，2g4，6，291
FK 263 DATA $\emptyset, 2 \varnothing 日, 5,169,1,1$ 57，194，6
IA 2640 DATA $232,136,268,230$ ，172，193，6，162
LH 265 DATA $34,262,2$ D日，253， $136,298,248,169$
JB 266 DATA $5,133,77,76,113$ ，69，162，6
BL 267 DATA $169,5,169,166,1$ 41，3，21ø，185
00268 DATA $114,67,141,2,21$ 6，169， 5,133
DF 269 DATA $20,165,20,201,1$ ø，144，25 ，2øø
AH 27 DЮ DATA $262,208,231,169$ ， $5,141,3,21$ ，
CD 2710 DATA $141,2,216,96,23$ $4,162,96,169$
HA 272 DATA $12,157,66,3,32$ ， 86，228， 162
AL 273 D DATA $96,169,119,157$ ， 68，3，169，72
BJ 274 Ø DATA $157,69,3,169,3$ ， $157,66,3$

NV 275＠DATA 169，28，157，74，3 169，5，157
k6 276ø DATA 75，3，76，86，228， 83，58， 155
HK 277！DATA $162,96,169,12,1$ 57，66，3，32
HH 278® DATA 86，228，162，96， 1 69，119，157，68
$60279 \boldsymbol{0}$ DATA $3,169,72,157,69$ ，3，169，3
JC 28øø DATA 157，66，3，169， 12 157，74，3
JF 281 DATA $169,1,157,75,3$ ， 32，86，228
6J 282ø DATA $169,74,185,189$ ， 72，145，88，136
B 283ø DATA 16，24日，173，31， 2 ฮ日，2ø1，6，2ø日
FH 284．DATA 249，173， 31,268 ， 2ø1，7，2ø8，249
HD 285＠DATA $76,79,72,35,47$ ， 4日，57，5ø
BP 286ø DATA $41,39,4 \varnothing, 52,0,1$ 7，25， 24
D0 287ø DATA 23，ø，ஜ，ஜ，ஜ，ஜ，ஜ， 163
JB 288® DATA $175,173,176,181$ ，18ø，165，129， 0
CI 289® DATA 176，181，220，72， B，73，162，142
OB 29øø DATA 14ø， $9,169,174,1$ 63，142，0，33
BL 291ø DATA 44，44， $0,50,41,3$ 9，4ø，52
BO 292ø DATA 51，ø，5ø，37，51，3 7，5ø，54
K1 293ø DATA 37，36，14，ø，ø，ø， ■， 112
EC 294．DATA $114,191,115,115$ ， $0,115,116,97$
AL 2959 DATA $114,116,155$

## Program 2：Commodore 64 Climber 5

Please refer to the＂MLX＂article in this issue before entering the following program
Ø8ø1：ØB Ø8 ØA øø 9E 3230362 E ø8б9：31 øø øø øø 4C FE Ø9 A2 C4 ø811：18 A9 øø 9D øø D4 CA 1ø 6A Ø819：FA A9 ØF 8D 18 D4 A9 FF 33 ø821：8D 日F D4 A9 8ø 8D 12 D4 24 ø829：60 8D 11 CB 8 A 489848 6A ø831：AE 11 CB BC 1A 11 A9 Øø 2A ø839：99 64 D4 BD $171199 \quad 65 \mathrm{C} 2$ Ø841：D4 BD 1D 119906 D4 BD 2C ø849：2ø 11 Dø ø3 AD 1B D4 9915 Ø851： 01 D4 BD $231199 \quad 94$ D4 CC ø859：49 Ø1 99 ø4 D4 68 A8 68 C3 Ø861：AA 60 A9 øø 85 FC AD 19 A8 Ø869：C8 ØA ØA ØA 85 FB ØA 2698 Ø871：FC 0A 26 FC 1865 FB 85 EA Ø879：FB A5 FC 69 øø 85 FC A5 DC ø881：FB 18 6D 18 C8 85 FB 859 E ø889：FD 85 3B A9 0465 FC 8531 ø891：FC 1869 BC 85 3C 1869 D5 Ø899：18 85 FE AØ Øø 6049 FF 15 ø8A1：85 ø2 E6 ø2 A5 ø2 6ø A2 8A Ø8A9：øø 2ø DE ø8 AD 55 C8 C9 3C Ø8Bl：27 9ø 29 AD 6E C8 8D $558 \emptyset$ ø8B9：C8 AD 66 CB 8 D 44 CB AD AF ø8Cl：2C C8 $2 \varnothing$ 9F 08 8D 2C C8 AF Ø8C9：AD F8 67 C9 Aø $9 \varnothing \varnothing 7 \quad 38$ F9 ø8D1：E9 1ø 8D F8 $076 \emptyset 18696 \mathrm{~F}$ Ø8D9：1ø 8D F8 $976 \varnothing$ BD 55 C8 52 ø8E1：9D 6E C8 BD 4C C8 9D 7789 ø8E9：C8 BD 44 C8 9D 66 C8 BD B8 Ø8Fl：3C C8 9D 5E C8 BD 2C C8 4A ø8F9：18 7D 44 C8 9D 44 C8 BD D7 Ø9ø1：2C C8 3ø ØB BD 55 C8 $695 \emptyset$ ø9ø9：ø0 9D 55 C 84 C 18 ø9 BD 4C ø911：55 C8 E9 øø 9D 55 C8 BD CE ø919：34 C8 18 7D 3C C8 9D 3C CE Ø921：C8 BD 34 C8 $3 \varnothing$ ØB BD 4C 8 F ø929：C8 69 øø 9D 4C C8 4C 3A 2C

Ø931：Ø9 BD 4C C8 E9 Øø 9D 4C 24 6939：C8 60 8D ØE C8 8A 48 98 F3 Ø941：48 A2 Ø5 AD B4 ø7 18 6D FA Ø949：ØE C8 8D B4 $\varnothing 7$ A9 ØØ 8D FD Ø951：ØF C8 BD AF Ø7 C9 3A $9 \varnothing 34$ Ø959：øD EE ØF C8 38 E9 ØA C9 63 Ø961：3A Bø F6 9D AF 07 CA BD 62 Ø969：AF Ø7 18 6D ØF C8 9D AF 75 Ø971： 07 E （ FF DØ D8 68 A8 68 6E Ø979：AA 6Ø A2 Ø7 AØ ØE A9 Øø 4E Ø981：8D 1Ø C8 BD 4C C8 10 øC 05 ஏ989：BD 2E 11 2D 15 Dø 8D 1517 Ø991：DØ 4C F8 Ø9 BD 2611 ØD 84 Ø999：15 Dø 8D $15 \mathrm{D} \varnothing$ BD 3C C8 2C Ø9A1：8D ØE C8 BD 4C C8 ØE ØE A2 ø9A9：C8 2A ØE ØE C8 2A ØE ØE 66 Ø9B1：C8 2A 69 1E 99 Ø1 DØ BD Fl Ø9B9：44 C8 8D ØE C8 BD 55 C8 63 Ø9Cl： 1 E ØE C8 2A ØE ØE C8 2A 7E 09C9： 1 E ØE C8 2A 8D ØF C8 2E 8A Ø9D1：10 C8 AD ØF C8 $1869 \begin{array}{lllllll}15 & 53\end{array}$ Ø9D9：99 ØØ DØ AD 1ø C8 69 Øø 24 Ø9E1：Fの ØC BD 2611 ØD 1Ø DØ 37 Ø9E9：8D 1ø Dø 4C F8 Ø9 BD 2E 3B Ø9F1：11 2D $10 \mathrm{D} 日 8 \mathrm{D} 10 \mathrm{Dg} 88 \mathrm{BD}$ Ø9F9：88 CA 10 8260 A9 93 2б 1E ØAØ1：D2 FF A9 $4 \varnothing$ AØ $112 \emptyset$ 1E 5F ØAø9：AB A9 FE 2Ø ØA 11 A9 Ø4 2B ØA11：8D 25 Dø A9 Ø6 8D 26 DØ 6D ØA19：A9 Ø1 8D 27 DØ A9 Ø4 8D 29 ØA21：Ø1 C8 A9 Øø 8D Ø2 C8 8D BØ ØA29：21 DØ A9 Øø 8D ØC C8 8D F2 ØA31：ØD C8 A9 Ø1 8D ØA C8 $2 \emptyset 89$ ØA39： $1 \emptyset$ Ø8 $2 \emptyset \quad 12$ ØE $2 \emptyset \mathrm{BE} 1 \varnothing \mathrm{FA}$ ØA41： $2 \emptyset$ BC ØA $2 \emptyset$ Ø8 ØB $2 \emptyset 9 \varnothing 15$ ØA49：ØС 2ø 7B Ø9 2Ø F8 1の AD 1E ØA51：Ø4 C8 FØ EC 1ø 4D A2 ØE 8F ØA59：AØ Ø3 18 2Ø FØ FF A9 Ø4 62 ØA61：8D Ø1 C8 A9 8A AØ 112049 ØA69：1E AB A9 FF 8D 16 C8 CE D1 ØA71：ØA C8 2Ø BC ØA AD Ø8 C8 6C
 ØA81：16 C8 DØ EE A2 ØE AØ Ø3 6D ØA89：18 2Ø Fø FF A9 AF Aø 11 2E ØA91：2Ø 1E AB 2Ø BC ØA AD Ø8 26 ØA99：C8 FØ F8 A9 ØØ 8D ØA C8 1B ØAA1：8D ØC C8 AE ØA C8 E8 EØ A9 ØAA9：Ø6 DØ Ø7 A2 Ø1 A9 Ø1 8D 3E ØAB1：ØC C8 8E ØA C8 2Ø BE 1Ø C4 ØAB9：4C 41 ØA A9 Øø 8D 2C C8 77 ØAC1：8D 34 C8 8D Ø8 C8 AD ØØ 5A ØAC9：DC 8D 99 C8 4A Bø Ø9 AE 33 ØAD1：3D 11 8E 34 C8 4C FD ØA 5B ØAD9：4A BØ 09 AE 3C 11 8E 34 C2 ØAE1：C8 4C FD ØA 4A BØ $\emptyset 9$ AE A3 ØAE9：3D 11 8E 2C C8 4C FD ØA F2 ØAFl：4A BØ Ø9 AE 3C 11 8E 2C D2 ØAF9：C8 4C FD ØA AD Ø9 C8 2932 ØBØ1：1Ø DØ Ø3 EE Ø8 C8 6Ø A9 7ø ØBø9：Øø 8D Ø5 C8 2Ø 6E ØD AD 32 ØB11：1C C8 Fø 16 C9 Ø1 DØ Ø3 DD ØB19：4C F5 ØB C9 Ø2 DØ Ø3 4C 76 ØB21：3E ØC C9 Ø3 DØ Ø3 4C 9E 8C ØВ29：ØB 60 AD Ø8 C8 8D 1C C8 9Ø ØВ31：FØ Ø3 4C C4 ØB AD 34 C8 96 ØB39：FØ ØD 2Ø AB ØD Dø Ø3 4C C7 ØB41：2F ØC A9 Øø 8D 34 C8 2016 ØB49：A8 Ø8 $2 \emptyset$ E1 ØD AD 2C C8 18 ØB51：FØ 12 3Ø Ø8 A9 92 8D 1A B7 ØB59：C8 4C 70 ØB A9 A2 8D 1A B2 ØB61：C8 4C 7Ø ØB A9 81 8D F8 I5 ØB69：Ø7 A9 Øø 8D 1B C8 6Ø EE F1 ØВ71：1B C8 AD 1B C8 C9 04 9ø B4 ØB79：Ø5 A9 øø 8D 1B C8 AD 1A C6 ØB81：C8 18 6D 1B C8 8D F8 Ø7 D6 ØB89：A9 ø1 4C 2A ø8 A9 85 8D 6ø ØB91：F8 Ø7 A9 ø3 8D 1C C8 A9 63 ØВ99：øC 8D ø7 C8 6ø A9 85 8D C8 ØBA1：F8 Ø7 CE $\quad 7$ C8 DØ ØF A9 91 ØBA9：Øø 8D 1C C8 A9 81 8D F8 9A ØBB1： 07 A9 Ø2 4 C 2A Ø8 $\mathrm{AD} \quad 07 \mathrm{BE}$ ØBB9：C8 C9 Ø3 Bø Ø5 A9 81 8D 71 ØBC1：F8 Ø7 6Ø A9 Ø1 2Ø 2A Ø8 A1
 ØBD1：A9 Ø1 8D 1C C8 A9 Øø 8D EA

ØBD9：1B C8 A9 A6 8D ØE C8 AD 33 ØBE1：2C C8 3ø Ø5 A9 96 8D ØE 67 ØBE9：C8 A9 ø9 8D ø6 C8 AD ØE 85 ØBF1：C8 8D 1A C8 A9 øø 8D 34 3C ØBF9：C8 AD 3E 11 8D 2C C8 AD 15 ØCø1：F8 Ø7 C9 Aø 9の Ø6 AD 3F D1 øCø9：11 8D 2C C8 $2 \varnothing$ A8 ø8 AD $8 \varnothing$ øC11：1B C8 CD 06 C8 Dø 99 A9 48 ØC19：øø 8D 1С C8 8D 1B C8 6ø 6F øC21：AD 1A C8 18 6D 1B C8 8D 28 øC29：F8 ø7 EE 1B C8 60 A9 92 2C øC31：8D 1C C8 A9 82 8D F8 67 ØE øC39：A9 øø 8D 1B C8 AD 34 C8 B7 ØC41：DØ Ø8 A9 83 8D F8 07 4C DB ØC49：6D øC AD ØD C8 49 Ø1 8D 9C ØC51：øD C8 Fø Ø1 6Ø AD F8 07 Ø3 ØC59：C9 84 Dø ø8 A9 82 8D F8 7D øC61：ø7 4C 6D øC A9 ø2 2ø 2A 3E ØC69：ø8 EE F8 07 A9 Øø 8D 2C 65 øC71：C8 A2 øø $2 \varnothing$ DE $\varnothing 82 \varnothing$ CC BC ØC79：øD FØ Ø9 $2 \varnothing$ DE ø8 $2 \varnothing$ CC 9B ØC81：øD FØ Ø1 60 A9 øø 8D 1C Ø7 øC89：C8 A9 81 8D F8 9760 AD CB øC91：ø5 C8 Fø Ø1 60 2ø 6E ØD F9 ØC99：A2 Ø7 $2 \varnothing$ A2 ØC CA DØ FA 1B øCA1：6Ø BD 1C C8 DØ $6 \varnothing$ AD 1 B E7 ØCA9：D4 29 3F CD ØA C8 Bø 6A 7A øCB1：BD 66 øD 9D 4C C8 A9 øø 96 øCB9：9D 3C C8 9D 34 C8 9D 44 E6 ØCC1：C8 9D 55 C8 AD 1B D4 2989 øCC9：1F 99 2ø 6D 3C 11 9D 2C 1C øCD1：C8 9D 1C C8 A9 AF 9D F8 ø6 ØCD9：ø7 AD 1B D4 29 3F CD ØB 7E ØCE1：C8 9ø ØD BD 2C C8 29 5F 36 øCE9：9D 2C C8 A9 B2 9D F8 9794 øCF1：AD 1B D4 2D øC C8 Fø øE 88 øCF9：BD 2C C8 $2 \varnothing$ 9F ø8 9D 2C 9B ØDø1：C8 A9 27 9D 55 C8 2ø DE 95 ØDø9：ø8 BD 55 C8 C9 2890 ØA E7 ØD11：A9 øø 9D 1C C8 A9 FF 9D FF ØD19：4C C8 BD F8 97 C9 B2 $9 \varnothing 28$ ØD21：øC AD 1C Dø 3D 2E 11 8D 8F ØD29：1C Dø 4C 5D ØD AD 1C Dø øD ØD31：1D 2611 8D 1C DØ DE 2464 ØD39：C8 Fø ØE $3 \varnothing 12$ BD 24 C8 51 ØD41：9D 27 Dø A9 AF 9D F8 6795 øD49：60 A9 B1 9D F8 6760 A9 5C ØD51：Ø6 38 ED ØA C8 ØA ØA ØA 67 ØD59：ØA 9D 24 C8 BD F8 0749 1A øD61：ø1 9D F8 0760 Ø1 ø4 $67 \quad 99$ ØD69：øA ØD 1ø 1316 AD 1E Dø 73 ØD71：FØ 31 A9 øø 2Ø 2A Ø8 A9 E8 ØD79：øF 2ø ØA 11 CE Ø1 C8 3ø Bl ØD81：23 Dø ØB A9 $2 \varnothing$ 8D Al 97 DE øD89：A9 FF 8D 94 C8 $6 \varnothing 20 \quad 85$ F7 ØD91：1ø 2Ø 7B Ø9 A9 Ø1 8D Ø5 2D ØD99：C8 A9 3C 2ø øA 11 AD 1E 1A ØDA1：DØ DØ FB $6 \varnothing$ A9 Øø 8D Ø1 47 ØDA9：C8 6ø AD 44 C8 3ø 1B AC 24 øDB1：4C C8 8C 19 C8 AC 34 C8 71 ØDB9：1ø Ø3 CE 19 C8 AD 55 C8 78 øDCl：8D 18 C8 $2 \varnothing 63$ ø8 Bl FB 5E øDC9：C9 6B 6ø AD 3C C8 C9 øø 23 ØDD1：DØ ØD A2 Ø8 AD 4C C8 DD 7A øDD9：66 ØD FØ ø3 CA 10 F8 60 A1 ØDE1：AD 55 C8 8D 18 C8 AD 4C A5 ØDE9：C8 8D 19 C8 2063 ø8 B1 CB ØDF1：3B C9 DA DØ øD A9 Ø1 8D 23 ØDF9：ø4 C8 A9 5A $2 \varnothing$ ØA 11 EE 5D ØEØ1：2ø Dø $6 \emptyset$ E6 FB DØ Ø2 E6 E9 ØEø9：FC 6ø E6 FD DØ Ø2 E6 FE D3 øE11：60 A9 F8 85 FB A9 1185 6D øE19：FC AØ øø A9 4085 FD A9 34 ØE21：20 85 FE Bl FB Fø 17 C9 45 ØE29：FE FØ 45 C9 FD FØ 3A C9 38 ØE31：FC Fø 4A 91 FD $2 \varnothing$ Ø4 ØE Fø ØE $39: 2 \varnothing$ ØB ØE 4C 24 ØE 8D ØE 31 ØE41：C8 $2 \varnothing$ Ø4 ØE B1 FB 8D ØF D2 ØE49：C8 AA AD ØE C8 91 FD C8 5C ØE51：CA DØ FA AØ Øø A5 FD 18 1B ØE59：6D ØF C8 85 FD A5 FE 69 4F ØE61：øø $85 \mathrm{FE} 2 \varnothing$ Ø4 ØE 4C 24 D5 ØE69：øE A9 øø 91 FD $2 \varnothing$ ØB ØE A4 øE71：A9 øø 91 FD 2ø ØB ØE $2 \varnothing$ DD ØE79：ø4 ØE 4C 24 ØE A2 Ø7 A9 99

ØE81：ø1 8D 1C Dø A9 AF 9D F8 52 ØE89： 07 CA Dø F8 A9 81 8D F8 EC ØE91：ø7 A9 91 8D ØE C8 A9 Aø 2E ØE99：8D ØF C8 2ø C3 ØE EE ØE 9D ØEAl：C8 EE ØF C8 A9 Aø CD ØE C5 ØEA9：C8 DØ FØ A9 BØ 8D ØE C8 B7 ØEB1：A9 B1 8D ØF C8 $2 \varnothing$ C3 ØE ØE ØEB9：A9 B2 8D ØE C8 A9 B3 8D CB øEC1：øF C8 A9 øø 85 FB 85 FD F1 øEC9：AD ØE C8 4A 66 FB 4A 66 1C ØED1：FB $85 \mathrm{FC} A D$ OF C8 4A 66 5E ØED9：FD 4A 66 FD 85 FE Aø 3C D9 ØEE1：8C 10 C8 Aø 3E 8C 11 C8 7A ØEE9：AC $1 \varnothing$ C8 Bl FB $2 \varnothing 23$ ØF 4A ØEF1：AC 11 C8 91 FD AC $1 \varnothing$ C8 66 ØEF9：C8 Bl FB $2 \varnothing 23$ ØF 91 FD DE ØFø1：AC 11 C8 Bl FB $2 \emptyset 23$ ØF A3 ØF09：AC 10 C8 91 FD CE 11 C8 C9 ØF11：CE 11 C8 CE 11 C8 CE 10 3A øF19：C8 CE 1ø C8 CE 10 C8 1036 ØF21：C7 60 8D 16 C8 A2 øø 8E AD ØF29：18 C8 8E 17 C8 A9 Øб ØE C3 øF31：16 C8 2A ØE 16 C8 2A Eø BB ØF39：øØ FØ Ø6 ØA ØA CA 4C 3841 ØF41：ØF ØD 17 C8 8D 17 C8 EE E2 ØF49：18 C8 AE 18 C8 Eø $\varnothing 4$ Dø 9F ØF51：DC AD 17 C8 60 A9 $312 \emptyset$ E4 ØF59：D5 10 AD 21 Dø 48 AD 86 B7 ØF61：ø2 8D 21 DØ A9 $932 \varnothing$ D2 C3 ØF69：FF 68 8D 21 Dø A9 øø 8D $2 \varnothing$ ØF71：18 C8 A2 64 8E 19 C8 $2 \varnothing$ EC ØF79：63 ø8 A9 7891 FB 91 3B E2 ØF81：A9 ØF 91 FD C8 Cø 28 DØ B4 ØF89：F1 AE 19 C8 E8 E8 E8 Eø 99 ØF91：17 9ø El AE ØA C8 BD Ø3 78 ØF99：10 А8 8С ø3 C8 B9 ØA $1 \varnothing \mathrm{FC}$ ØFAl：8D 18 C8 AA B9 ØB 10 8D F7 ØFA9：19 C8 A8 $182 \emptyset$ FØ FF A9 8B ØFB1：7D Aø $112 \varnothing 1 \mathrm{EAB} 2 \varnothing 63 \mathrm{lE}$ ØFB9：ø8 A9 6B 91 3B Aø 2891 ØB ØFCl：3B AØ $5 \varnothing 91$ 3B AC $\varnothing 3$ C8 24 ØFC9：С8 C8 B9 ØA 1Ø DØ CB A2 54 ØFD1：Ø3 AØ Ø2 $182 \emptyset$ F0 FF A9 C9 ØFD9：71 $2 \emptyset$ D2 FF A9 DA 8D Al 88 ØFE1：CØ A2 17 AØ Ø2 $182 \emptyset \mathrm{~F} \emptyset 97$ ØFE9：FF A9 D4 Aø $112 \varnothing 1 E$ AB Ø8 ØFF1：A9 øE 38 ED ØA C8 ØA ØA DF ØFF9：8D ØB C8 AD ØA C8 69 3ø øC 1øø1：4C D2 FF øø lF 3C 57 6C Ø1 1øø9：øø 04 Ø4 0414 Ø4 22 Ø7 E6 1011：0A 07 1C ØA Ø4 ØA 14 ØA 96 1019：22 ØD ØA ØD 1C 10 Ø4 10 D8 1ø21：14 1ø 22 13 ØA 13 1C $\varnothing \varnothing 99$ 1ø29：ø4 ø4 Ø4 22 Ø7 ØD 07 1C 85 1ø31：ØA Ø7 ØA ØF ØA 16 ØD ØC 19 1ø39：øD 1A 1ø ØA $101813 \quad 0414$ 1ø41：13 131322 øø 04149773 1ø49：04 Ø7 22 ØА Ø4 ØА 14 ØА 8С 1ø51：22 øD ØE ØD 1D 10 ø5 10 9B 1059：14 13 ø3 $1314 \begin{array}{llllllllllll}13 & 23 & \text { ø日 } & \text { øD }\end{array}$ 1ø61：Ø4 14 07 Ø4 0722 ØA Ø2 80 1ø69：ØA 1C ØD ØF ØD 19101429
 1079：ø1 ØA 21 ØD 65 1ø 1E 1349 1ø81：ø2 13 25 øø A2 Ø7 А9 øø 90 1ø89：9D 1C C8 9D 44 C8 9D 3C 2 F 1091：C8 A9 FF 9D 4C C8 CA 1085 1099：ED AD 38118 D 55 C 8 AD 35 1øAl：39 11 8D 4C C8 A9 81 8D 96 1øA9：F8 07 A2 $\varnothing \varnothing$ A9 D3 9D A1 D5 1øB1：67 E8 EC 01 C8 DØ F5 A9 5C 1ØB9：2Ø 9D Al $676 \varnothing 2 \varnothing 56$ ØF 35 $1 \varnothing \mathrm{C} 1: 2 \varnothing 851 \varnothing 2 \varnothing 7$ В 99 A9 øø AA 1øC9：8D 1C C8 8D 64 C8 AD 1E 66 1ØD1：DØ DØ FB 6Ø ØA ØA 8D E9 91 1øD9：10 A9 øの 8D E8 10 8A 48 2A 1øE1：98 48 Aø Ø4 A2 Øø 9D Øø Ø5 1øE9：C8 E8 Dø FA EE E9 1088 3A 1øF1：D $\varnothing$ F2 68 A8 68 AA $6 \varnothing$ A2 $2 \varnothing$ 10F9：øø Aø 19 E8 Dø FD 88 DØ 54 11ø1：FA AD 8D ø2 C9 ø1 Fø F9 øC 11ø9：60 65 A2 8D 16 C8 A5 A2 A3 1111：CD 16 C8 Dø F9 $6 \emptyset 36$ øø 83 1119：øø øø ø7 ø7 øø 63 FØ D4 DØ 1121：ø1 ø1 80 81 81 ø1 ø2 ø4 44

1129： 0810204080 FE FD FB 53 1131：F7 EF DF BF 7F 162713 F8 1139：16 14 EC 40 Cø $5 \emptyset$ Bø 11 C6 1141：20 $434 \mathrm{~F} 5059524947 \quad 21$ 1149：48 $\begin{array}{lllllllll}14 & 20 & 31 & 39 & 38 & 37 & 20 & \text { F4 }\end{array}$ 1151：43 4F 4D $5 \emptyset 555445213 \mathrm{~F}$ 1159：2ø $5 \varnothing \quad 55 \quad 42$ 4C 494341 BD 1161：54 49 4F 4E 53 ØD 2ø $2 \varnothing$ FD 1169：41 4C 4C $2 \varnothing 5249474859$ 1171：54 53 2ø $52 \begin{array}{llllll}52 & 45 & 53 & 45 & 52 & 1 \varnothing\end{array}$ 1179：56 4544 øø AB B3 11 9D 8C 1181：9D AB B3 11 9D 9D AB B3 53
 1191：2ø 54 4F 2ø 434 F 4 E 54 ØD 1199：49 4E 5545 20 415420 Cl 11A1：54 484953 2ø 4C $45 \begin{array}{llllll}56 & 71\end{array}$ 11A9：45 4C 2ø 92 9A ø0 9E 12 D2 11B1：2ø $2 \varnothing 1649 \begin{array}{lllll}46 & 49 & 45 & 2 \varnothing & 54 \\ 85\end{array}$ 11B9：4F $2 \varnothing 524553544152 \mathrm{EA}$ 11Cl：54 $2 \varnothing 4154204 \mathrm{C} 455696$ 11C9：45 4C $2 \varnothing$ 4F $4 \mathrm{E} 45 \quad 2 \varnothing 2 \varnothing 82$ 11D1：92 9A Ø0 4C 495645 53 2A
 11E1：4C $4556454 \mathrm{C} 2 \varnothing 2 \varnothing$ øø BD 11E9：FD 50 FD Aø FE Ø2 A8 FE 39 11F1： 02 A8 FE $\varnothing 2$ A8 FE $\varnothing 1$ øø 82 11F9：øD AØ FD 5ø FD 5ø FD Aø 5D 12ø1：FE ø2 A8 FE ø2 A8 FE Ø2 DC 12ø9：A8 FE $\emptyset_{1} 44$ FD FØ FD Aø FB 1211：FD Aø FD Aø FD Aø FD Aø 35 1219：FD Aø FD Fø Øø ØF Ø4 FD 75 1221： 68 FD A8 FD 58 FD 58 FE 28 1229： 02 A8 FE Ø2 Aø $\mathrm{FE} \emptyset 2 \mathrm{~A} \varnothing$ 1E 1231：FE 62 Ag FE $\mathrm{gl} \mathrm{F}_{1} \mathrm{FG}$ FD Ag Cl 1239：FD AØ FD AØ FD BØ FD 8Ø 7D 1241：FD 80 FD Cø Øø 15 AØ FD E3 1249：50 FD 5ø FE Ø2 A8 FE Ø2 C1 1251：A8 FE Ø1 A4 FD AØ FD FØ 53 1259：FD Aø FD Aø FD Aø FD Aø 7D 1261：FD Aø FD EØ FD 30 Øø ØE 39 1269：ø1 FD Ø2 FD Ø2 AØ FE Ø2 $4 \varnothing$ 1271：5ø FE Ø2 5ø FE Ø2 AØ FD Ø2 1279：A8 FD A8 FD A8 FD F4 FD 8B 1281：AØ FD AØ FD AØ FD EØ FD 26 1289：2ø FD $2 \varnothing$ FD $3 \varnothing$ øø 18 Aø 73 1291：FE Ø4 51 FE Ø8 52 FE Ø2 D9 1299：A8 FD AØ FD FØ FD AØ FD 44 12A1：Aø FE Ø2 ø8 FE Ø2 Ø8 FD A4 12A9：CC øø 8D BD øø 3F 45 øø 49 12B1：3F 55 øø 3 F ø5 øø 3 F 44 A9 12B9：øø 3F 4D Øø 3F 55 Øø 3F E5 12Cl：4F øø 3F ØC Øø 3F 65 Øø FD 12C9：4D AØ FD 5ø FD $5 \varnothing$ FD Aø 4 F 12D1：FE Ø2 Aø FE Ø2 AØ FE Ø2 8C 12D9：AØ FD 94 FD FØ FD AØ FD FE 12E1：Aø FD 88 FD 88 FE Ø2 ø8 13 12E9：FE Ø8 Ø8 FE ØС ØС ØØ 1223 12F1：Aø FD $5 \emptyset$ FD 50 FD AØ FD 89
 13ø1：ø2 AØ FD E4 FD AØ FD $2 \varnothing$ EC 13ø9：FD 28 FD 28 FD Aø FE ø3 ED 1311：AØ FD Cø Øø 15 AØ FD $5 \varnothing 96$ 1319：FD 5ø FD Aø FE Ø2 AØ FE 5C 1321：ø2 Aø FE Ø2 A4 FD 7ø FD 6C 1329：AØ FD AØ FD 88 FD 88 FE 5F 1331：Ø2 20 FE ØC $2 \varnothing$ FD $3 \varnothing$ Øø 5A 1339：12 Aø FD 5Ø FD 5Ø FD AØ 23 1341：FD Aø FE Ø2 Aø FE Ø2 Aø 34 1349：FE Ø2 Aø FD E4 FD AØ FD C1 1351：20 FD 28 FD 28 FD Aø FE 65 1359：Ø3 Aø FD Cø Øø 12 AØ FD 7C 1361：50 FD 5Ø FD Aø FE Ø2 Aø BE 1369：FE Ø2 Aø FE Ø2 AØ FD 6486 1371：FD Fø FD Aø FD Aø FD 8893 1379：FD 88 FE Ø2 ø8 FE Ø8 ø8 15 1381：FE øC ØC Øø 16 Aø FE Ø1 DD 1389：40 FE $\varnothing 5$ FD 28 FD A8 $4 \varnothing$ DA 1391：FE AA FE Ø3 AØ FE Ø2 CØ B7 1399：FE ØA 8 8 FE Ø8 8Ø FE $2 \varnothing 22$ 13A1：8 8 FE C $\varnothing 8$ FE Ø2 FD ØC EF 13A9：Øø 25 Ø2 8Ø EA EA 64 Ø2 2 F 13B1：EA 60 EA $\varnothing 2$ øø ø3 A4 øø 38 13B9：32 ø2 8ø EA EA 64 EA EA E1 13Cl：6ø FE Ø2 Øø Ø3 A4 øø 31 F3 13C9：30 FD 3A BA $6 \varnothing$ Ø2 BA $6 \varnothing$ 5B

13D1：FE 0 A 90 Øの 2 E 30 FD 3872 13D9：FD 28 FD ØA FD Ø2 Bø FD Cø 13E1：EA 60 FE ØA 60 FE Ø2 $2 \varnothing 39$ 13E9：FD $84 \mathrm{FD} 1 \varnothing$ øø 32 E （ FE 7A 13F1：øC ø8 FE ø2 28 FD AF FD B6 13F9：ØE 60 FE ø2 60 FE Ø2 84 C 6 14ø1：FD 90 øø 29 ø3 FD 28 FD 3D 1469：AC FD 3A FD 日A FD 1A FD A8 1411：94 FD Aø Øø 26 Ø2 $8 \varnothing$ FE $5 \emptyset$ 1419：Ø1 4б FE Ø1 44 FE Ø2 A2 86 1421：FE ø2 8A FE Ø2 BA FE ø2 85 1429：BA FD 73 Cø øø 1C ø2 $8 \emptyset$ 9D 1431：FE Ø1 40 FE Ø1 40 FE ØA 22 1439：FD ØA FD ØB FD ØA FD Ø9 $7 \varnothing$ 1441：8ø FE ø2 Aø FD A＠FE ø2 26 1449：8Ø FE Ø2 FD ØC Øø 852421 1451：øØ 3F 25 ØØ 3 F 65 ØØ 3 F BC 1459：ø4 øø 3 F ø4 øø 3 F 44 øø 31 1461：3F ØC øø 3F Ø4 øø 3F ø4 C2 1469：øø 3F 44 øø $3 F 54$ øø $3 F 74$ 1471：24 øø 3F A6 øø 3F E6 FE C7 1479：28 FD AA FE Ø2 AA 8 0 ØA $4 \emptyset$ 1481：AA Aø øø 27 ØA AA AØ Ø2 D7 1489：AA 80 FE AA FD 28 FE FF $4 \varnothing$ 1491：FE 28 FD AA FE 62 AA 8083
 14A1：FD Ø1 øø ø3 4ø FE Ø1 FD 37 14A9： 64 FD 10 FD 64 FD Ø1 FD 4D 14Bl：ø4 FD 1ø FD 44 FE Ø1 Øl 5E 14B9：FE ØA AA AØ Ø2 AA $8 \emptyset_{\text {FE FD }}$ 14C1：AA FD 28 FE FF 003 FFF 32 14C9：FE EB FE 03 AØ FD EC FD 51 14D1：2B FD EC FE 03 AØ FD EC $2 \varnothing$ 14D9：FD 2B FD EC FE 63 AØ FD 9D 14E1：EC FD 2B FD EC FE 63 Aø 4 F 14E9：FD EC FD 2B FD EC FE 0363 14F1：AØ FD EC FD 2B FE 63 AC 6 F 14F9：FD Ø2 FC øø øø øø øø øø 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 54

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Compute！Publications，Inc． 4 All Rights Reserved． 4
DEFINT a－z
men＝5：SAY TRANSLATES（＂climer fiv e！＂）
DIM map $(45,24)$ ，mdat $(106), \operatorname{chk\& }(7)$ ，ex（4），ey（4），ty（4），old（2），mindex （4）：endmap＝1øø4
GOSUB DefinePLayFieLd
RESTORE mapdata： $\mathrm{t}=1$ ： $\mathrm{cm}=14$
WHILE $\mathrm{t}<>-14$
READ $\mathrm{t}: \operatorname{mdat}(\mathrm{c})=\mathrm{t}: \mathrm{c}=\mathrm{c}+14$
IF $\mathrm{t}=\emptyset$ THEN mindex $(\mathrm{cm})=\mathrm{c}: \mathrm{cm}=\mathrm{cm}+1$
WEND 4
mapdata： 4
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， 64
DATA $1,3,1,16,2,5,2,15,3,9$ ， 3，11， $4,7,4,14,6$
DATA $1,9,2,3,2,13,3,7,3,17$ ， 4，14， 84
DATA $1,7,2,17,3,3,3,10,4,15$ ， 04
DATA 1，10，2，4，3，13，4，9，－14
4
stand＝$\varnothing: c 1=867: r t l=313: r t 2=42 \varnothing$ ： duck＝103：baLL＝654：gird＝603：hook＝ 6854
c2＝974：Ltl＝1ø81：Lt2＝1188：shortho ok＝13714
GOSUB makeshapes：
NewBoard： 4
GOSUB MakeMap： $\mathrm{px}=266: \mathrm{py}=138: \mathrm{psn}=$ 3134
PUT（px，py），shape（psn）：$c f=\emptyset 4$ FOR $i=\varnothing$ TO 4：ex（i）＝32б：NEXT 4 main： 4

WHILE vnext= 04
'keyboard input4
$k f=33: d x=\varnothing: d y=\varnothing: a=\varnothing 4$
WHILE $d x=\emptyset$ AND $d y=\emptyset$ AND $k f>\emptyset\langle$ $a \$=I N K E Y \$: a=A S C(a \$+"$ ") 4
IF $a=29$ THEN $d y=8$ : GOTO keypresse
d 4
IF $a=28$ THEN $d y=-8:$ GOTO keypress ed 4
IF $a=31$ THEN $d x=-8$ : GOTO keypress ed 4
IF $a=3 \emptyset$ THEN $d x=84$
$\mathrm{kf}=\mathrm{kf}-14$
keypressed: 4
WEND 4
GOSUB pLayer ${ }^{4}$
'hooks ${ }^{\prime}$
FOR $\mathrm{n}=\emptyset$ TO 44
IF ex( $n$ ) < 318 THEN onscreen 4
PUT (ex(n), ey (n)), shape(hook), XOR
4
$t \mid=\operatorname{RND}(1): I F t 1>.3$ THEN eskip
IF $t 1>.2$ THEN esn $(n)=$ hook ELSE esn $(n)=$ shorthook 4
$\operatorname{ex}(n)=\emptyset: t y(n)=n * 4+1: e y(n)=n * 32+9$
4
PUT $(\operatorname{ex}(n), e y(n))$, shape $(\operatorname{esn}(n))$, XOR4
onscreen: 4
th=esn(n) 4
PUT (ex(n), ey (n)), shape(th), XOR 4 $\operatorname{ex}(n)=e x(n)+164$
PUT (ex(n),ey(n)), shape(th), XOR4 $\mathrm{tx}=\mathrm{ex}(\mathrm{n}) / 8: \mathrm{ty}=\mathrm{ty}(\mathrm{n}) \leftarrow$
IF th=hook AND ( map $(t x-1, t y+1)=$ 2 OR map $(t x, t y+1)=2$ OR map $(t x-2$, $t y+1)=2$ ) THEN GOSUB kiLLed 4
IF map $(t x-1, t y)=2$ OR map $(t x, t y)=$ 2 OR map $(t x-2, t y)=2$ THEN GOSUB $k$
iLLed 4
eskip: 4
NEXT4
WEND4
t\$="I got the ball":IF building>
$\emptyset$ THEN $t \$=t \$+"$ again." 4
IF building=4 THEN $t \$=$ "I am gett ing tired." 4
IF vnext $=2$ THEN SAY TRANSLATES $(t$ \$) 4
vnext= $=$ \&
IF men> $\varnothing$ THEN NextMap 4
SAY TRANSEATES("game over.")
LOCATE 1,1:PRINT " (C)ontinue ":
PRINT " (R)estart ":PRINT " (
Q) uit " 4
men=54
Loopg: aS=INKEYS:IF aS="r" THEN building= $=$ :GOTO NewBoard 4
IF a\$="c" THEN GOTO NewBoard4
IF a\$="q" THEN CLS:CLEAR:STOP 4
GOTO LOOpg 4
NextMap: 4
building=(building+1) MOD $5<$
GOTO NewBoard4
kiLLed: 4
SAY TRANSLATES("ouch.") 4
PUT (px,py), shape (psn), XOR 4
FOR $i=\varnothing$ TO 2:map (mx,my+i-2) $=01 d$ (i):old(i)=ø:NEXT

PUT (ex(4), ey (4)), shape(esn(4)), XOR 4
$p x=266: p y=1384$
ex $(4)=318: p s n=s t a n d: c f=\varnothing 4$
PUT (px,py), shape(psn):men=men-1
IF men $=<\emptyset$ THEN vnext $=1:$ men $=\varnothing<$
LOCATE 23,8:PRINT " Climbers ";m
en;" Level ";building+1;4
RETURN $\leqslant$
4
pLayer: 4
WHILE INKEYS<>"":WEND 4
$m x=p x / 8: m y=(p y+17) / 84$
map $(m x, m y-2)=o l d(\emptyset) 4$
map $(m x, m y-1)=o l d(1) \neq$
map $(m x, m y)=o l d(2) ~ 4$

IF dy AND $c f=\emptyset$ THEN GOSUB trycLi n:b4
ON cf GOTO cLimbing, ducking 4 IF dx THEN movepLay 4
sf=sf+l:REM standing on girder 4
IF $s f>2$ THEN PUT ( $p x, p y$ ), shape ( $p$ sn), XOR:PUT ( $p x, p y$ ), shape(stand) :sf=1:psn=stand
GOTO oLdmap 4
4
trycLimb: 4
$t=m y: I F \quad d y>\emptyset$ THEN $t=m y+14$
IF map $(\mathrm{mx}, \mathrm{t})=1$ THEN $\mathrm{cf}=1:$ RETURN 4 IF $d y>\varnothing$ THEN PUT ( $p x, p y$ ), shape ( $p$ sn), XOR: PUT (px,py), shape(duck): psn=duck:cf=2 4
RETURN 4
4
moveplay: 4
$\mathrm{sf}=\varnothing$ : $\mathrm{pb}=\mathrm{r} \mathrm{tl}:$ IF $\mathrm{dx}<\varnothing$ THEN $\mathrm{pb}=\mathrm{L} t 1$ 4
$t x=p x+d x: t y=p y 4$
IF $t x<8$ OR $t x>3 \sigma \sigma$ THEN $t x=p x 4$
IF $t x=1 \emptyset$ AND $t y=1 \emptyset$ THEN $\mathrm{fr}=1: \mathrm{pb}=$ duck: vnext=24
GOTO animate ${ }^{4}$
4
ducking: 4
IF $d x$ OR $d y<\varnothing$ THEN $c f=\varnothing: p s n=d u c k$ : RETURN 4
GOSUB oLdmap 4
$\operatorname{map}(m x, m y-2)=04$
RETURN 4
4
cLimbing: 4
IF $d y=\emptyset$ THEN oLdmap 4
$\mathrm{pb}=\mathrm{cl}: \mathrm{tx}=\mathrm{px}: \mathrm{ty}=\mathrm{py}+\mathrm{dy}: \mathrm{tmy}=(\mathrm{ty}+17)$ 184
IF (tmy AND 3) $=3$ THEN $c f=\emptyset: p b=s t$ and: $\mathrm{fr}=1$
GOTO animate 4
4
animate: $\&$
PUT (px, py), shape(psn),XOR 4
$\mathrm{fr}=1-\mathrm{fr}: \mathrm{psn}=\mathrm{pb}+\mathrm{fr} \mathrm{F}^{*} 1674$
PUT (tx,ty), shape (psn) 4
$p x=t x: p y=t y: m x=p x / 8: m y=(p y+17) / 8$
4
oLdmap: 4
old $(\sigma)=$ map $(m x, m y-2): m a p(m x, m y-2)$ $=24$
old $(1)=\operatorname{map}(m x, m y-1): \operatorname{map}(m x, m y-1)$ $=24$
old $(2)=\operatorname{map}(m x, m y): \operatorname{map}(m x, m y)=2 \leftarrow$ RETURN 4
MakeMap: 4
FOR i= Ø TO 39:FOR j=Ø TO 244 $\operatorname{map}(i, j)=\varnothing:$ NEXT $:$ NEXT $^{4}$
$c=$ mindex(building) $: C L S: y c=\emptyset \&$
FOR y=yc TO yc+18ø STEP 32:FOR x $=\varnothing$ TO 319 STEP 84
PUT ( $x, y$ ), shape(gird):NEXT:NEXT 4 WHILE mdat (c) $>$ ø 4
$y 2=m \operatorname{dat}(c): x 2=m d a t(c+1) * 2: m y=y 2$ * 44
FOR $j=$ my TO my $+3: \operatorname{map}(x 2, j)=1:$ NEX T 4
tx=x2*8:ty=y2*32-54
LINE ( $t x, t y)-(t x+16, t y+36), \varnothing, b f 4$ LINE ( $t x, t y$ ) $-(t x+2, t y+36), 8, b f 4$
LINE $(t x+14, t y)-(t x+16, t y+36), 8$,
bf4
FOR $j=t y+4$ TO ty +28 STEP 84
LINE $(t x+2, j)-(t x+14, j), 8, b: N E X T$
j 4
temp: 4
$\mathrm{C}=\mathrm{C}+24$
WEND 4
$\operatorname{PUT}(2 \varnothing, 28)$, shape $(b a L L): \operatorname{map}(\varnothing, \varnothing)$

## $=-1 \quad 4$

LOCATE 23,8:PRINT " Climbers ";m en;" Level ";building+1;
4
RETURN $孔$
makeshapes: 4
i2 $=\varnothing$ : RESTORE makeshapes:CLS 4 LOCATE 10,2:PRINT "Copyright 198 7 Computel Publications" 4
LOCATE 12, 10:PRINT "All rights $r$ eserved." 4
FOR $i=\emptyset$ TO 7:READ chk\&(i):NEXT 4 checksums 4
DATA 445496, 818859, 13938514
DATA 19Ø2864, 2002109, 21009104
DATA 2406221, 26062604
DIM shape (1599) 4
'shape $\varnothing$ man standing still4 $\mathrm{m}=1 \varnothing 2$ :m2= 58:GOSUB ReadCompres sed 4
DATA $14,22,4,4$ øø 2,256 , 896 , 1408 , 3968 4
DATA 1792 , 8160 , 16368 , 30664 , $4124,32756,15736,81764$
DATA 304ø , 24øø, 736 , 2240
2784 , $3808,7920,154804$
DATA 4øøø2, $768,3968,1280$
3840 , $768,3840,81604$
DATA 16368 , 30680,14296 , 683 $2,2080,1024,1664,3 \varnothing 724$
DATA 1568, 1024, 4øØ07, 128Ø
, $3840,768,1536,04$
DATA 2ø8Ø, $4112, \varnothing, 272 \emptyset, 4 \varnothing$ $64,1728,1728,31364$
DATA 1632 , 1088 , 40037.4
'shape 1 cLimbing 4
$\mathrm{m}=1$ 102 :m2=43:GOSUB ReadCompres sed 4
DATA $14,22,4,40 \emptyset \emptyset 7,128$, 448 , 64ø , 1920 4
DATA $896,8176,16376,16376$ , 16376 , 16376 , 8176 , 81764 DATA $7280,7280,31868,400 \emptyset 7$ , 384 , 1984 , 640 , 19204
DATA $128,896,8176,5098,4$ $368,12312,4112,400134$
DATA 640, 1920, 128, 896, 25 6 , Ø, 31ø4, 15288 \&
DATA $6448,2 \emptyset 8 \emptyset, 2 \emptyset 8 \varnothing, 4 \emptyset \emptyset 36$ ,
'shape 2 ducking
$m=1 \varnothing 6: m 2=56$ :GOSUB ReadCompres sed 4
DATA $14,23,4,40003,8192$
, 29440, 30592, 22400 4
DATA $29440,27872,24720,136$ $40,6728,3832,3432,76644$ DATA 7024, 58ø8, 4848, 6896, 7920 , 7920 , 7776 , 30724 DATA 4 Øøø $4,8960,1920,8192$ , 8960 , 13056 , 16352 , 81764 DATA 2032 , 2032 , 656 , 528 , 1 $152,2112,3072,10244$ DATA 4øøø8 , 8192, 4øøø2, 768 , $4864,0,2048,10564$ DATA Ø, 640, $4080,3296,316$ $8,3104,3168,30724$ DATA 400384
'shape 3 run right4
$\mathrm{m}=1 \varnothing 6: \mathrm{m} 2=63:$ GOSUB ReadCompres sed 4
DATA $13,23,4,0,512,332$ 8, 8ø64, 7424 4
DATA $8664,3856,5688,1420 \emptyset$
, 25584 , -8288 , 32704 , 161284 DATA 7936 , 8064 , 6ø80, 9184 19952 , $23008,-27712,-2176$ \& DATA $29568,14816, \emptyset, 1536$, $3840,8128,1280,19204$ DATA 3584 , 1552 , 7728 , 16224 , 28480, 14080, 6656, 3072 4 DATA $\varnothing, 2048,7168,12288,8$ 192 , 24576 , 40007, 1280 4 DATA $192 \emptyset, 3584,1552 ; 16, \emptyset$ , 64 , Ø , $2 \varnothing 484$
DATA 3072, 768, 2944, 7616
12384 , 8384,24960 , 4 øø 38 \&
'shape 4 running right second $f$ rame4
$\mathrm{m}=182: \mathrm{m} 2=95:$ GOSUB ReadCompres sed4
DAT
－，112，ø
DATA $254, ~ Ø, 232, ~ Ø, 252$ ，Ø ，12ø，$\varnothing$ 4
DATA 24ø，Ø ，944，Ø， 1919 ，－ 32768 ， 3519 ，－16384 4
DATA $4 \varnothing 31,-32768,2 \varnothing 4 \varnothing$ ，Ø ， 1
Ø23 ，6，383，－16384 4
DATA $15871,-16384,32739,-819$
$2,-64,-512,-6208,322564$
DATA $384,28672,40002,48$ ，
Ø，12ø ，Ø ， 2544
DATA $\varnothing, 4 \varnothing, ~ \varnothing, 6 \varnothing, ~ \varnothing, 112$ ，
6， 1124
DATA Ø ， 224 ，Ø ， 688 ，Ø ， 175
$9,-32768$ ，608 4
DATA $\varnothing, 768,40003,128,400$
19，40，Ø，60＜
DATA $\varnothing, 112, ~ \emptyset, 48,40004,-$
32768 ， $513,-16384$ 4
DATA $\varnothing,-32768,768$ ，$\varnothing, 752$ ，
Ø ， 239 ，$\varnothing$ 4
DATA $227,-32768$ ，1216．，－16384 ， 1920 ， 16384 ， 384 ， $4 \varnothing 663$ 4
＇shape 5 girder ${ }^{4}$
$\mathrm{m}=5 \emptyset: \mathrm{m} 2=25$ ：GOSUB ReadCompress ed4
DATA $8,9,4,0,1624,-1624$ ，30720， 13656 4
DATA $-36976,-12544,4096,400$ Ø2，8192，4øøø5 ，－32256，Ø 4 DATA－256 ，－256 ， $768,-30976$ ，－ $13312,3072 \varnothing$ ， $12288,-256$ 4
DATA－ 256 ， $4 ø ø 214$
＇shape 6 ball
$\mathrm{m}=3 \emptyset: \mathrm{m} 2=14$ ：GOSUB ReadCompress ed
DATA $5,4,4,30720,18432$ ，
$22528,30720,12288$ 4
DATA $3072 \emptyset, 30720,12288,184$ $32,40002,18432,400164$ ＇shape 7 hook 4
$\mathrm{m}=182$ ：m2＝53：GOSUB ReadCompres sed 4
DATA $15,20,4,4088,2032$ ， 992 ， 448,448 4
DATA $448,448,448,448,992$ ， 480 ， 448 ， 40324
DATA $16352,30720,-4096,-4096$ ，28672，14340， 4088,40964 DATA $2496,1152,512,4 ø \emptyset \emptyset 6$ ， 512，Ø ，4128， 16384 4
DATA $-32768,2 \emptyset 48, \emptyset,-3 \emptyset 72 \emptyset$ $17416,4100,4096,20484$ DATA $1 \varnothing 24,512,40 \emptyset \sigma 6,512$ ， Ø，4128，16384，－32768 4 DATA $2 \emptyset 48, \emptyset,-3 \emptyset 72 \emptyset, 17416$ ， $41 \varnothing \varnothing$ ，4ø12ø
PUT $(\dot{\sigma}, \varnothing)$ ，shape（ $2 \varnothing 6$ ）： $\operatorname{PUT}(3 \varnothing, \varnothing)$ ， shape $(r t l) 4$
PUT $(6 \varnothing, \varnothing)$ ，shape $(r t 2): \operatorname{PUT}(9 \varnothing, \varnothing)$ ，shape（hook） 4
GET $(9 \varnothing, 12)-(1 \varnothing 5,20)$ ，shape（short hook）4
$\operatorname{GET}(\varnothing, \emptyset)-(14,23)$ ，shape $(\mathrm{cl}) 4$
$x 2=\emptyset: y^{2}=\emptyset: y^{3}=4 \emptyset: p s n=c 2: n x=14: n y=$ 23 ：GOSUB ReverseBob 4
x2＝30：psn＝Lt1：nx＝13：ny＝23：GOSUB ReverseBob
$x 2=6 \emptyset:$ psn＝Lt $2: n x=25: n y=20:$ GOSUB ReverseBob 4
RETURN 4
ReverseBob： 4
FOR $i=\emptyset$ TO $n x-14$
FOR $j=\emptyset$ TO ny－14
$t=$ POINT $(i+x 2, j+y 2) 4$
PRESET（ $x 2+n x-i, j+y 3$ ），$t \nleftarrow$
NEXT ${ }^{j} 4$
NEXT i 4
GET $\left(x^{2}, y^{3}\right)-\left(x 2+n x, y^{3}+n y\right)$ ，shape（ psn） 4
RETURN 4
ReadCompressed： 4
FOR $\mathrm{j}=\emptyset \mathrm{TO} \mathrm{m} 24$
READ $t \&: s \&=s \&+t \& 4$
IF t\＆$<4$ Øøøø\＆THEN shape $(i 2)=t \&: i$
$2=i 2+1$ ELSE FOR $i=\emptyset$ TO $t \&-4 \emptyset \emptyset \emptyset \emptyset \&$
：shape（i＋i2）$=\varnothing$ ：NEXT：i2 $=$ i $2+$ t $\&-4 \varnothing \varnothing$ Øø\＆ 4
NEXT 4
IF chk\＆（ns）＜＞s\＆THEN PRINT＂erro $r$ in checksum＂；ns：PRINT＂or in shape＂；ns；＂data statements＂：STOP ns＝ns +14
RETURN4
$\stackrel{+}{\text { RET }}$
DefinePLayFieLd： 4
SCREEN $1,32 \sigma, 2 \emptyset \sigma, 4,14$
WINDOW 1，＂Climber 5＂，，2，14
RESTORE DefinePLayFieLd 4
FOR $\mathrm{i}=\varnothing$ TO 74
READ $\mathrm{a} 1, \mathrm{~b} 1, \mathrm{c} 14$
PALETTE $i, a!, b l, c!4$
PALETTE $i+8, \mathrm{a} 1, \mathrm{~b} \mid, \mathrm{c} 14$
NEXT ：PALETTE 8，．25，．25，． 254
DATA $.45, .45, .6, .1, .1, .1,$.
$85, .85, .8, .8, .7, .74$
DATA ．85，．1，．1，．6，．45，．4，．
$45, .4, .3,1, .6, .54$
RETURN 4

## 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．
OA $1 \emptyset$＇COPYRIGHT 1987
NH $2 \emptyset$＇COMPUTE！PUBLICATIONS，INC
$A B 3 \emptyset$＇ALL RIGHTS RESERVED．
BP $4 \emptyset$ KEY OFF：DEF SEG＝$\emptyset: D E F I N T$ A $-Z:$ POKE 1ø47，PEEK（1ø47）OR 64：RANDOMIZE TIMER
HG $5 \emptyset$ SCREEN 1，$\emptyset:$ COLOR 1，1：WIDTH $4 \emptyset$
HA 60 CLS
EF $7 \emptyset$ PRINT TAB（14）＂Copyright 19 87＂
6689 PRINT TAB（8）＂Compute！Publ ications，Inc．＂
AC $9 \varnothing$ PRINT TAB（12）＂All Rights R eserved．＂
NK 1øØ FOR $X=1$ TO 24Øø：NEXT
6B 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 GUSUB 18ø：PL＝5：LV＝1
FK 130 POKE 1ø5ø，PEEK（1ø52）：GOSU B 359
K6 149 GOSUB 38ø
KB $15 \emptyset$ IF CD THEN SOUND 37，5：GOS UB 736：GOTO 69ø
CH 160 GOSUB 479：IF $X C<>B L X(L V)$ OR LL＜＞6 THEN $14 \varnothing$
MD $17 \emptyset$ GOSUB 73ø：PUT（BLX（LV）$+3,4$ 7），$B L: L V=L V+1: I F L V=5$ THE $N 71 \emptyset$ ELSE PUT（BLX（LV）+3 ， 47），BL：LOCATE 24，23：PRINT LV；：GOTD $13 \mathscr{}$
6D $18 \emptyset$ RESTORE 76ஏ：CLS
JK $19 \varnothing$ READ LT1（ஏ），LT1（1）：FOR I＝ 2 TO 15：READ A\＄：LT1（I）$=$ VA L（＂\＆H＂＋A ）：NEXT
N1 2øø READ LT2（ø），LT2（1）：FOR I＝ 2 TO 15：READ A\＄：LT2（I）＝VA L（＂\＆$H^{\prime \prime}+A \$$ ）：NEXT
DB $21 \varnothing$ READ RT1（ø），RT1（1）：FOR I＝ 2 TO 15：READ A\＄：RT1（I）＝VA L（＂\＆H＂＋A\＄）：NEXT
IC $22 \emptyset$ READ RT2（（ø），RT2（1）：FOR I＝ 2 TO 15：READ A\＄：RT2（I）＝VA L（＂\＆H＂＋A\＄）：NEXT
Jo 230 READ CL1（ $\sigma$ ），CL1（1）：FOR I＝ 2 TO 15：READ A\＄：CL1（I）＝VA L（＂\＆H＂＋A ）：NEXT
OP $24 \emptyset$ READ CL2（ $)$ ，CL2（1）：FOR I＝ 2 TO 15：READ A\＄：CL2（I）＝VA L（＂\＆H＂＋A ）：NEXT
LA $25 \emptyset$ READ LADR（ $)$ ，LADR（1）：FOR

I＝2 TO 37：READ A $=$ LADR（I） ＝VAL（＂\＆H＂＋A ）：NEXT
MA 269 LOCATE 3，17：PRINT＂CLIMBER 5＂：LOCATE 24，18：PRINT＂LE VEL 1＂；
DA 27ø LINE（ $5, \varnothing)-(\varnothing, 7), 1: \operatorname{LINE}(8$ ， Ø）－（8，7）， $1: \operatorname{GET}(\varnothing, \varnothing)-(\varnothing, 7)$ ，WPS：GET（ $\varnothing, \varnothing)-(8,7)$ ，WPC：P UT（ $\Xi, \boxed{\text { E }}$ ，WPC
BJ 28Ø RESTORE 28פ：FOR $I=1$ TO 4： READ BLX（I）：NEXT：DATA 252 ，188，124，69
DC 290 FOR $I=\emptyset$ TO 6：LINE（58，5ø＋2

BH 3øø CIRCLE（ 256,48 ），1：PAINT（ 25
$6,48)$ ： $\operatorname{GET}(255,47)-(257,49$ ），BL
NO 31ø FOR $I=\emptyset$ TO $5: Y=47+20 \% I$
BP 329 IF（I AND 1）$=1$ THEN FOR $J$ $=\emptyset$ TO 3：PUT $(63+J * 64, Y)$ ，LA DR，OR：NEXT
LP 330 IF（I AND 1）$=\varnothing$ THEN FOR $J$ $=g$ TO 2：PUT $(95+J \geqslant 64, Y)$ ，LA DR，OR：NEXT
6 6． $34 \emptyset$ NEXT：RETURN
OH 359 PUT（256，157），LT1：XP＝256：Y $P=157: X C=256: Y C=157$ ：$D I R=1$ ：DIRP＝1：DHP＝1：FR＝ø：STAND＝ 1
ON 36Ø FOR I＝ø TO 6：WPO（I）＝ø：WPX （I）＝$\quad$ ：WPY（I）$=38+I$ \％ $2 \emptyset:$ NEXT
NL． 379 RETURN
BD $38 \emptyset \mathrm{DX}=\emptyset: \mathrm{DY}=\emptyset$
JA 390 K\＄＝RIGHT\＄（INKEY\＄，1）：A\＄＝RI GHT（INKEY\＄，1）：IF A ${ }^{(1)}\langle>"$＂ THEN K $=\mathrm{A}$ \＄
60 4øø POKE 1ø5ø，PEEK（1ø52）：GOTO 639
NE $41 \varnothing$ IF $\mathrm{K} \$=\mathrm{CHR}$（72）THEN IF（ XC＋32弗（INT（ $(Y C-21$ ）／2g）AN D 1））MOD 64）$=\emptyset$ AND YC $>37$ THEN DIR $=9$ ：$D Y=-4$ ：GOTO 46 ■
CD 420 IF K\＄＝CHR\＄（8ø）THEN IF（ $($ XC＋32家（INT（ $(Y C-17) / 2 \sigma)$ AN D 1））MOD 64）$=\emptyset$ AND YC＜15 7 THEN DIR＝ø：DY＝4：GOTO 46 g
KC $43 \varnothing$ IF $K \$=$ CHR $\$(75)$ THEN IF（ $Y$ C－37）MOD 2ஏ＝ø AND XC＞6ø THEN DIR＝1：DHP＝1：DX＝－4：GD TO 46פ
KK 44ø IF K $\$=$ CHR $\$(77)$ THEN IF（ $Y$ C－37）MOD 29＝ø AND XC＜26の THEN DIR＝2：$D H P=2: D X=4: G 0$ TO 46D
HP $45 \emptyset$ IF $D X=\emptyset$ AND DY＝ø THEN IF STAND THEN $39 \mathscr{D}$ ELSE DIR＝D HP
FK 46 D XC＝XC＋DX：YC＝YC＋DY：RETURN
DA 47ø STAND＝1：ON DIRP GOTO 5øø， 529
BP $48 \emptyset$ IF FR AND 1 THEN PUT（ $X P, Y$ P），CL2 ELSE PUT（XP，YP），CL 1
㫙 49 GOTO 54ø
AB 5 ． 0 IF FR AND 1 THEN PUT（ $X P, Y$ P－1），LT2 ELSE PUT（ $X P, Y P$ ）， LT1
F6 51の GOTO 54ø
CB 520 IF FR AND 1 THEN PUT（XP，$Y$ $\mathrm{P}-1$ ），RT2 ELSE PUT（XP，YP）， RT1
6K 53ø GOTO 54ø
MA 54ø FR＝1－FR：ON DIR GOTO 58ø， 6 ロロ
EI 550 IF FR AND 1 THEN PUT（XC，$Y$ C），CL2 ELSE PUT（XC，YC），CL 1
ML． 56 © STAND＝NOT（ $(Y C-37)$ MOD 2g＝ g）
FG 579 GOTO 629
JB $58 \emptyset$ IF FR AND 1 THEN PUT（ $X C$ ，$Y$ $\mathrm{C}-1)$, LT2：STAND $=\emptyset$ ELSE PUT （XC，YC），LTI

6K $59 \emptyset$ GOTO 62ø
NO 6．g IF FR AND 1 THEN PUT（XC，$Y$ C－1），RT2：$S T A N D=\varnothing$ ELSE PUT （XC，YC），RT1
FL 61ஏ GOTO 62g
IF 629 DIRP＝DIR：$X P=X C: Y P=Y C: R E T U$ RN
HD $63 \varnothing \mathrm{LL}=\mathrm{INT}((\mathrm{YC}-37) / 2 \emptyset)+6: \mathrm{LH}=\mathrm{L}$ L＋2
B1 649 FOR J＝LL TO LH：$I=J$ MOD 7： IF ABS（XC－WPX（I）－56）＜5 TH EN IF ABS $(Y C-W P Y(I)+2)<1 \varnothing$ THEN CD＝1
NE 659 IF WPQ（I）THEN WPX（I）$=$（WP $X(I)+8)$ MOD 224：WPY $=38+I$（ 2פ：PUT（WPX（I）＋4B，WPY（I））， WPC：WPO（I）＝WPX（I）ELSE IF RND＞． 8 THEN PUT（WPX（I）+4 B，WPY（I）），WPC：WPO（I）＝1
00660 NEXT
M 679 IF CD THEN RETURN
EK 68ø GOTO 41ø
FI 69 P PL＝PL－1：LOCATE 3，24：PRINT PL
QK 790 IF PL＞Ø THEN $13 \emptyset$
JN 710 LOCATE 5，12：PRINT＂Another game（ $Y / N$ ）？＂
8F $72 \boldsymbol{6}$ K\＄＝INKEY\＄：IF K\＄＝＂Y＂THEN 120 ELSE IF K $\$=$＂N＂THEN C LS：END ELSE 720
JE 739 FR＝1－FR：GOSUB 54פ：FOR $I=\emptyset$ TO 6：PUT（WPX（I）＋56，WPY（I ）），WPS：NEXT：CD＝ø
NJ 74ø RETURN
BD 750 REM LT1
OS 76 DATA 12，13，8øø2，8ø2A，CøøF ，2，86ØA，CØЗA
 5ஜ14，1ஜ1ஜ，FळFஜ，ø
CE $78 \emptyset$ REM LT2
BJ 790 DATA $12,12, A, A A, 3 F, 8,2 A, C$ ■EB
DD 8øØ DATA Cø2A，Cø2B，15，51，7ø71

EC 81ø REM RT1
BE 82ø DATA $12,13,28,8 ø 2 A, 3 F, 8,2$ A，Cø3A
Q $83 \emptyset$ DATA $3 F, 2 A, 15,11,4 \emptyset 51,494$ D，FøFg，$\varnothing$
FD 849 REM RT2
FH 85פ DATA 12，12，A，AøøA，CøøF，2， BøछA，BøЗE
ND 86פ DATA 8ஏ3A，8ø3E，4øØ5，5øø4， DஜD4，СஜСø，उСøø，ø
HH 879 REM CLI
OH $88 \emptyset$ DATA $14,13, A, C F, 82, A \emptyset A A, A$ 828，88ø日
B6 899 DATA 8CøA，4øø5，4øø5，4ஏø4，

HF 9øg REM CL2
明 919 DATA 14，13，8øø2，CCפ3，8ø2， AB2A，A5AB，BøB8
BK 926 DATA 8øCA，4øø5，4ஏø5，4ஏø4， Cछछ4，4，C，
FB 930 REM LADDER
CF $94 \emptyset$ DATA 18，23，Cø，CøCØ，Cøøஜ，C Ф，СøСஜ，Сஏஜø
KD $95 \mathscr{\square}$ DATA Cø，FFCØ，CøFF，Cø，CøCØ ，Cஏøळ，Cפ，FFCஜ
 ，FFC®，CஜFF，Cg
LP $97 \emptyset$ DATA CøCØ，Cøøø，Cஏ，FFCØ，Cø FF，Cø，CøCø，Cøøø
FC 98Ø DATA Cø，CøCØ，CØØø，Cø，Cø，Ø

## Program 5：Apple II

## Climber 5

Please refer to the＂MLX＂article in this issue before entering the following program
øСøø：A9 9120 ED FD AD 83 1A FB
 ØC19： 85 ED 2983 1A A9 63 ES 66 פC18：FA A9 11 日5 FB 20171677
øC2ø：A9 øø 日D 83 1A 2023 18 A6 øC28： $2 \emptyset$ 3B 18 A9 ø5 日D 86 1A 42 ØC3Ø：A9 øØ 日D 日5 1A A9 20 85 64 øC38：E6 29 F2 F3 A9 4g 日5 E6 A9 øC4の： 29 F2 F3 A9 øø 8D 87 1A 9D ØC4B：BD 88 1A 日D B4 1A 265183 ØC5ø： 18 AD $57 \mathrm{C} \emptyset \mathrm{AD} 54 \mathrm{Cg}$ AD C4 ØC58： 53 C AD 5 Cø $2 \emptyset$ B1 18 Ø7 ФC6D：A5 E6 85 1D 49 6פ B5 FF 5E ØC6B：Aஜ Øø 84 1C 84 FE B1 1C C2 øC70： 91 FE 88 Dø F9 E6 1D E6 BB øC78：FF A5 FF 29 1F Dø EF A9 52 gCBg：4B 85 EE A9 10 E5 EF A9 3B פC8B：g® 8D 97 1A 日D 9日 1A 8D 29 ØC90： 99 1A A9 70 日D 95 1A 20 4F øC98：DE 15 A9 BB 日D 96 1A 日D AB ØCAØ：4F 10 A2 04 BE B9 1A 20 AB øCAB：DS 日F AE B9 1A A9 FF 9D F4 פCBछ：AA 1A A9 Øø 9D A5 1A CA 5C gCBE： 10 EA $2 \varnothing 1918$ BD BA 1 A AF gCCØ： 20 E5 13 AD 96 1A C9 98 5日
 ØCD6： 54 A2 64 AD 96 1A DD 1B 日B
 פCED：BD AS 1A Fg 25 AD 95 1A BE øCEB： 69.04 DD 9B 1A Bg 1B 69 5F
 ØCFB：1A 1ø 3F AD 9B 1A C9 Ø1 A6
 ๓Dø日：Dø $3 \emptyset$ CA 1ø CG 2ø 7E øD B1 ØD19： 29 ØB פF AD B4 1A D月 4F 37
 6D20：1C 3C 5C 7C 9C EE B5 1A 76 øD28：AD 85 1A C9 95 Dg 55 A9 79 ตD3ஜ：ตg 日D 85 1A $2 \emptyset$ JB 18 4C 6A øD3日： 35 ตC CE B6 1A Fg ø6 2ø F2 ØD4ø： 3 B 18 4C 35 ØC A9 5D Ag 3D $\begin{array}{llllllllll}\text { OD4B：} & 1 A & 20 & 93 & 18 & 20 & 73 & 18 & 2 C & 96\end{array}$
 ตD58： 10 Cø 29 DF C9 CE Fø 97 4ø ஜD6D：C9 D9 DG EE 4C 2B פC 2C 32

 øD7B： $2 \boldsymbol{5 B}$ FC 4C Dg ø3 A9 4B 4E פDEg：日5 EE A9 1985 EF AD 9ø 96


 ตDAछ： 83 Dg øJ 8D 84 1A 29 DF AB פDAB：AE 97 1A Eg $\emptyset 5$ Bg 63 Eg EJ
 øDBE： 66 Dø 57 C9 CD Dø 53 38 22 ตDCø：A9 日日 ED 9A 1A 日D 9A 1A 6F פDCE：A9 $\quad 97$ 4D 97 1A Dø 5E CA 38
 ตDDE：A2 06 C9 D5 Fg 5g CA C9 84 gDEg：CF Fg 4B A2 02 C9 CA Fg 7ø ＠DEB： 45 CA C9 CC Fø 49 CA C9 46 ØDFø：CB F曰 3B C9 CD Dø 692015

 ตEø日： 99 A2 93 A9 ஏ8 日D 9A 1A 12 ■E1m：D月 1C CE 99 1A 1月 31 AE 31 gE18： 97 1A EE 9日 1A AD 98 1A Cg gE2F：DD A4 GE BE ES DD AC GE 28 GE2日：Bø ØD BD B4 बE AA BE 97 B2 ตEJø：1A BD AC 日E 日D 98 1A 2062 gE3B： 2316 BD 9C gE BD 99 1A Eg ตE4छ：BD 51 GE 4B BD 49 GE 48 4D GE4B： 6047 5B 5E B1 7E 5B 6175
 ตE5日：פE A9 ø1 2C A9 gЗ 2C A9 24 GE6B：FF 2C A9 FD 日D 75 EE 1813 のE6B：6D 95 1A C9 FB Bø ØA C9 51
 פE7B：EE 日D 95 1A 4C DE 15 A9 65 gEBg：g4 2C A9 FC 18 6D 96 1A 6C פEBB：8D 96 1A BD 4F 1ן CE 9A 20





 ตECg：EC 18 6D 96 1A 8D ES GE 4D gECE：AD 4 E 1月 $18 \quad 69 \quad 62$ 日D DC 1 E

GEDG：GE AE B5 1A BD 6519 AA 52 ตEDB：BD 6A 19 C9 øø Dø 97 BD 3D
 ØEE8： 19 Fø 1E EB EB Dg E9 AD 2C
 ตEFB：1A EB C9 Ø1 FØ $62 ~ C A ~ C A ~ 95 ~$ פFøø：8E 95 1A BA 20 DE 153895 øFø日： $6 \emptyset 18$ 6Ø A2 ஏø 8E B9 1A 5A のF1ø：BD AS 1A Fg 2C 1ض 103 DE 4F פF1B：9B 1A 18 7D Ag 1A 9D Ag AE ØF20：1A $9 \varnothing$ Ø3 FE 9B 1A BD 9B 1C פF28：1A C9 8С 9ø ஏВ A9 ஏø 9D FC

 øF4の：$\sigma F$ CE BA $1 A$ Dø $4 \varnothing 201973$ פF4日： 18 AC 85 1A D9 92 øF BD D7 ØF5ø：ø3 B9 92 ØF 日D BA 1A 2ø 4D øF5B： $1918 \mathrm{D9} 92$ बF Bø $193 \mathrm{B9} 68$ 6F6Ø： 92 gF 9D AF 1A 9D B4 1A 05
 פF79：BF 9D A5 1A A9 $9 \emptyset 9 D$ Ag 55 ØF78： $1 A$ BC A5 1A 1ø 92 A9 8C 91 6F8Ø：9D 9B 1A 20 E9 ØF AE B9 3C ФF8B：1A EB Eø 05 Fg 93 4C $0 D 93$
 øF98：2B 1ø AE B9 1A BD AA 1A FB ØFAg：C9 FF Fg 1C FE AA 1A BD 18 GFAB：AA 1A C9 04 DG IF A9 FF 72 ØFBD：9D AA 1A BD AF 1A 9D B4 3D ØFB8：1A AD Ø5 A9 Øø 91 EE GØ CB ØFCØ：DE B4 1A DØ FA AØ Ø5 A9 D9 ØFCB： 1191 EE A9 Øø 9D AA 1A 2A
 ตFD8：ØF 2ø 2B 1ø 20 E2 øF $2 \emptyset$ B7
 ØFEB： 602025 10 20 1C 102096 $\begin{array}{llllllllll}\text { ØFF } & \text { Ø6：} & 1 \emptyset & 2 \emptyset & 2 B & 1 \emptyset & 2 \emptyset & 1 C & 1 \emptyset & 16\end{array}$ øFF8：$A E$ B9 1A A9 FF 9D AA 1A Aø 1øøø：20 31 1ø 20 1C 1ø Aø 55 E7 1øø日：A9 9191 EE $6 \emptyset 202510$ उC 1ø1ø： 29 1C 1020 2B 19 2g 1C 41 1ø18： 10203110 AE B9 1A BD BD 1ஏ26：9B 1A 4C DE 15 A9 73 Ag E2
 1ஏЗØ： 94 A9 95 AØ 10 日5 EE 8472 1ø38：EF AE B9 1A BD 4410 A2 96 1ø49：EE 4C BE 17 Øø 39699046

 1ø58： $1243126312 \quad 8312$ A3 31 1ø6ø： 12 CJ 12 EJ 12 øJ 1323 Eg 1ø68： $13 \quad 431363138313$ A3 EB
 1ø78：$\emptyset \emptyset 6311$ D7 1A EJ 1A 63 ■9
 1ø88： 11 EF 1A 2E 1B AS 11 C3 Ag




 1øBE： 11 9D 1B DC 1B AJ 11 CJ 47




 1وEB： 11 4B 1C BA 1C AS 11 CS ES


 11ø8：øD 63 11 E1 1C ED 1C 6377
 1118： 11 F9 1C 38 1D AS 11 CS AS


 1138：๓® 63 11 8F 1D 9B 1D 6343 1149： 115511 日g 1148： 11 A7 1D E6 1D AS 11 CS 4C







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Photography
Bookkeeping \& Accounting

[^1]Street




































 12AB： 63 øø øø øø øø ๓ø ஜø øø 7E


















 1348：65 øø øø øø øø øø øø øø 21

















 13EØ：ØØ Øø Øø FF FF A9 Øø 日D 3B 13E8： 89 1A 8D BA 1 A AD 4910 DE 13FØ： 85 EE AD 4A 1985 EF AS øC 13F8：EE $05 \mathrm{EF} F \mathscr{} 11 \mathrm{~A} 95 \mathrm{~B} 1 \mathrm{AB}$ 14のø：EE Fø 93294514 A2 EE EC 14ø日： $2 \emptyset$ A3 17 4C F7 13 2ø EG Ø4 1419： $17 \quad 202114 \mathrm{AD} 89$ 1A 8 AD 86 1418： $871 \mathrm{~A} A D 8 A 1 A$ BD 881 A 1 B 142פ： $6 \emptyset$ AD 87 1A 85 1C AD 88 F6 1428： $1 A 85$ 1D A5 1C 65 1D Fg DC

1430：6B 2ø 9E 15 A2 1C 20 A3 74 1438： 17 4C 2B 14 A9 90 日D 8795
 1448：EE 85 FA CB B1 EE 85 FB 85 145פ：Ag פЗ B1 EE AA 8B B1 EE 7B 1458：AØ ø2 18 71 FA C9 $\varnothing 79 \mathscr{D} 99$ 146ø：פ5 E9 67 EB Bø F7 BD BF 65 1468： 1 A BA $8 D$ BE 1 A Aø $\emptyset 4 \mathrm{B1} \mathrm{ET}$ 147の：EE 18 Ag $\emptyset 371$ FA BD 9ø 7D 1478：1A AD BF 1A øA 6964 A8 53 148月：B1 FA 85 FC CB B1 FA 8549 1488：FD 9869 gD AB B1 FA 85 5B 149ø：1A C8 B1 FA 85 1B Ag Øø B7 1498：B1 FA BD 91 1A AD BE 1A E1 14Ag： 49 FF C9 DB 9ø øC 6928 EJ 14AB：CD 91 1A 9026 AD 91 1A $8 D$ 14Bg：Bg 2169 Ø1 4B A2 FC 29 9D 14BE：BE $17 \quad 68$ A2 $1 \mathrm{~A} \quad 20$ BE $17 \quad 23$ 14Cg：AD 8E 1A A2 g® BE BE 1A 42 14C8： 18 6D 91 1A FØ 94 C9 28 7F 14DØ： $9 \varnothing$ Ø1 6Ø 日D 92 1A AD 9Ø 4F

 14EB：FA Bg 326961 AC 91 1A $8 F$ 14Fg： 20 F7 17 48 $18 \quad 65$ FC 8564 14FB：FC 9865 FD 85 FD 68 18 5F 15פø： 65 1A 85 1A 9865 1B 85 CB 15ø8：1B AD 9ø 1A A2 Øø 日E 9ø A1 151ø：1A 18 Aø 0171 FA Fஜ g4 CE 151日：C9 AD 9ø 11 Gø 日D 93 1A EB

 1536：1C CB B1 EE 85 1D AD DD A1 1538：AD 89 1A 91 1C CB AD 8A E1 1549：1A 91 1C A5 1C 日D 89 1A FD 1548：AS 1D 8D 8A 1A CB AS FE 25 1550： 91 1C C8 A5 FF 91 1C CB 65 1558：AD 92 1A 91 1C CB AD 93 4D 1560：1A 91 1C A9 06 A2 1C 20 2D 1568：BE 17 AC 92 1A BB B1 FE CB 1570：91 1C 31 1A 51 FE 51 FC 5B 1578： 91 FE 88 10 F1 AD 91 1A C 1580：A2 FC 20 BE 17 AD 91 1A D7 1538：A2 1A 20 BE 17 AD 92 AA 29 1599：A2 1C 20 BE $17 \quad 297417 \quad 3 C$ 159日：CE 93 1A Dø CD 6ø Aø 9292 15Ag：B1 1C 85 FE CB B1 1C B5 16 15AB：FF CB B1 1C 8D 92 1A CB B 15Bø：B1 1C 8D 93 1A 18 A5 1C $3 E$ 15BE： 69 פ6 85 FC A5 1D 69 Øø øE 15CØ： $85 \mathrm{FD} A C 92$ 1A 8B B1 FC 3F 15C日： 91 FE 日8 10 F9 AD 92 1A 53
 15D日：CE 93 1A DG ES 66 日D EC 58 15ED： 15 A9 øø 85 E3 A2 94 4A 54 15E8： 66 EJ 18 69 פØ 6 GA 66 E3 33 15Fg：4A 66 E3 CA Dg F1 AA AS 4C 15FB：E3 2A 2A 2A 2A $29 \quad 97$ C9 55
 1698：90 10 69 05 C9 07 90 ø3 8C 161ø：E9 ø7 EB 4B BA 18 69 B6 D2 1618：AA 68 Aø 0291 EE BA CB פE 1620： 91 EE 6Ø ØA 18 69 פC AB A4 1628：B1 EE 48 CB B1 EE Aø 97 1ø 163ø： 91 EE 68 88 91 EE $6 \emptyset$ Ag 20 1638：ஏø B1 FA 8D 92 1A C8 B1 49 164ஜ：FA 8D 93 1A 2D 92 1A C9 13 1648：FF Fø 24 A9 $0418 \quad 65$ FA 16 165\％： 85 CE A9 $\emptyset 065 \mathrm{FB}$ B5 CF 1E 1658：29 79 16 A9 פE A2 CE 2ஏ C6 1669：BE $17 \quad 297916$ A9 26 A2 F6 1668：FA 29 BE 17 4C $3716 \quad 69 \quad 2 F$ 167פ：A9 פø BD BF 1 A AD BF 1 A DC 1678：GA A8 B1 CE 85 FC C8 B1 5A 168g：CE 85 FD CB AS EC 91 CE 94 1688：CB A5 ED 91 CE AD 931 C7
 1698：6A B1 FC 2A AA 9Ø ø3 $991 F$ 16Aஜ： 8 2 2 C 29 7F 91 EC C8 CC D3 16AB： 92 1A Dø EB AD 92 1A A2 פC 16Bø：FC 29 BE 17 AD 92 1A A2 3B 16B8：EC 2ø BE 17 CE 94 1A Dø 7A 16Cg：D2 AC 日F 1 A CB BC BF 1 A CG 16CB：CØ פ6 DØ A9 6Ø BE D9 1692 16Dg：AA A9 $\emptyset \square 85$ ES Aด 9418 D6 16D8： 69 פの 6A 66 E3 4A 66 E3 66

16EG： 4 A 66 EJ B8 Dg F1 AB AS 16 16E8：E3 2A 2A 2A 2A $29 \quad 97$ C9 47

 17øø：E9 67 CB AA $98 \quad 18 \quad 69 \quad 24$ C4 1768：6ø AA 98 6פ AD 9ø 1A 29 37 1716： $3 F$ A日 B9 3417 ©5 E6 B5 A2 1718：FF AD 9ø 1A 29 ø8 Fø $\quad$ Ø2 $\quad$ B2 1720：A9 日 1日 2С 901 1A $7 \emptyset \quad 64$ DA 1728： $10 \quad 646928 \quad 69 \quad 28 \quad 6 \mathrm{DE} \quad 64$


 1748： 1111519 1D 151 1750： 111519 1D 62 Ø6 ØA 15 BB
 1769： 1216 1A 1E ø3 97 פB $9 F$ 9B 1768： 1317 1B 1F 13 פ7 פB 0 FF 94 177ø： 1317 1B 1F 18 A5 FF $69 \quad 94$ 1778：$\emptyset 4$ 日5 FF 2C A2 17 Fø 0121 178月： 60 E9 1F 85 FF AS FE 6993
 1790：AS FF 29 ต3 Fg 91 6の A5 DE 1798：E6 日5 FF A5 FE $6927 \quad 8567$ 17AD：FE 6ஏ 1C B5 90 BD B3 17 F9 17AB：BS Ø1 BD B4 17 BE B6 17 66 17Bも：A2 Ø1 BD FF FF 95 FF CA 49 17BE： 10 FB AE B6 $17 \quad 6 \emptyset 18754 \mathrm{E}$

 17DØ：B5 Ø1 79 Ø1 $\boxed{17} 95 \quad \emptyset 1 \quad 6 \varnothing 12$ 17D日：A9 øø 38 F5 øø 95 øø A9 42 17EØ：ஏø F5 Ø1 95 Ø1 $6 \emptyset$ A2 $0 \emptyset$ D4
 17FØ： 54 CØ 496985 E6 $6 \emptyset$ A2 D3 17F8：ஏB 85 EB 84 F9 A9 Øø 85 4E 18øØ：EJ CA $3 \emptyset 12$ ØA 26 E3 Ø6 B2 18ø日：EB 9ø F6 18 65 F9 90 F1 DB 181ø：E6 EЗ DØ ED A9 ØØ A4 EJ 20 1818：6Ø A5 4E ØA ØA $38654 E 96$ 182の： 85 4E 6פ 2ø 58 FC A9 02 Cg 1828：AØ 1A 299318 A9 ØE Ag 9ø 1830：1A 269318 A9 2D Ag 1A C6 1838：4C 9318 A9 43 Aの 1A 20 02 184ø： $9318 \quad 207318 \quad 2 C 10$ Cg CD 1848：AD Øø Cø $1 \varnothing$ FB 2C $1 \emptyset$ Cø D9 1850：6® 2g 58 FC A9 7C Ag 1A 2E 1858： 2093 18 A9 73 Ag 1A 20 日D 1869：93 18 AD 日5 1A 18 69 B1 24 1868：日D F7 96 AD 86 1A 69 Bø 19 187\％：日D D7 96 A9 64 日5 FF A9 98 1878：ஏ日 日5 1D Ag øø 84 FE 84 5ø 188Ø：1C B1 FE 91 1C 88 Dg F9 C2 1888：E6 FF E6 1D AS FF 29 g3 5D 189ø：Dg EF 6985 FC 84 FD Ag 29 1898：פூ B1 FC 85252922 FC 18 18Ag：CB B1 FC 8524 C8 B1 FC 3E 18AB：Fg 06 2g ED FD CB Dg FG 61 18Bあ： $6 \emptyset$ A9 $\emptyset 4$ 日D BC 1A A9 $9 \varnothing$ F4 18B8：日D 日E 1A A9 1B 日D 9Ø 1A 7B 18Cछ： 20 ØC 17 A9 64 日D 94 1A 1B 18C8：A9 AA Ag 2791 FE 49 7F 99 18DØ：8日 1ø F9 $2 ø 7417$ CE 94 BC 18D8： 1 A $10 \mathrm{ED} 18 \mathrm{AD} 9 \emptyset$ 1A 69 A6 18Eの： 20 日D 9月 1A CE 日C 1 A 1025 18EB：D7 AE 日5 1A BD 6519 日D 46 18FØ：BB 1 A AE 日B 1A BD 6A 19 B1 18FB： $8 D$ BE $1 A$ EB BD 6A 19 日D BC 19ஜぁ：9Ø 1A EB BE BB 1A GD BE 74 190日：1A Fg 2A 2g øC 17 A9 23 FD 191ஏ：日D 94 1A A9 BA 85 FC A9 9B 1918： 19 B5 FD Aø 01 B1 FC 91 5C 1929：FE B8 10 F9 A9 92 A2 FC 2D 1928：20 BE 17207417 CE 9431 1930：1A D® EB FØ BD A9 $\emptyset \emptyset$ 日5 E9 1938：FC A9 1A 85 FD A9 93 日D 19 1940：日E 1A A9 19 8D 9Ø 1A 29 ØA 1948：ஏC 17 A9 92 8D 94 1A Ag 2F 195ø：ØD B1 FC 91 FE 267417 20 1958：A9 11 A2 FC 2ø BE 17 CE BC
 1968： 36469914 1B 14 Ø5 34 日C 1978： $21 \quad 34$ GF 54 1D $5417 \begin{array}{llllll} & 54 & 44\end{array}$
 1989： $1534695425 \quad 54$ 1B 74 D5


1990： 13 34 日B 542554 1F 74 2D




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# Bank Street Writer Plus 

Ervin Bobo

Requirements: Apple IIe, IIc, or IIgs computer with minimum 128 K 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 dropdown 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
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$\$ 99.95$ IBM PC and compatibles

# Might And Magic 

James V. Trunzo

Requirements: Apple II-series computers ( 64 K 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 500 K 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 antimale. 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 en-
counters-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 flickerfree, 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 $18 \times 12$ 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 192 K 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 $\mathrm{M}+\mathrm{A}+\mathrm{X}$-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 $\mathrm{M}+\mathrm{A}+\mathrm{X}$ 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 providedweather 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 awardwinning 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 roleplaying 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 $3 / 4$-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

# 凅 <br> Computers and Society 

## 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 publish-ers-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!, AddisonWesley, 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 spe-lunker-an avid cave explorerand 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 outputexcept 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 1-800TEAMXRX—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.

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 $31 / 2$-inch drives, analog monitors, and direct addressing of
megabytes of memory, but IBM's ability to produce full-color 24page magazine inserts as well as TV ads featuring the cast of " $\mathrm{M}^{*} \mathrm{~A}^{*} \mathrm{~S}$ " $\mathrm{H}^{\prime}$ 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 PCcompatible 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
$\$ 1000^{\prime \prime}$ 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 $\$ 700$ PCclone 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?®

## 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 doubleclicked 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 $i t$ ? 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. . . ." ©

## 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 li.ae 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 com-bination-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" <br> 30 GOTO 20

And here is a GOTO loop using a variable:
$20 \mathrm{~A}=\mathrm{A}+1$
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 <br> 30 PRINT N <br> 40 NEXT N

The STEP size can even be a fraction:

```
20 FOR X=1 TO 4 STEP . }
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 $\mathrm{N}=\mathrm{A}$ 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 $\mathrm{A}=1$ 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 FORNEXT 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 WHILEEND. 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 NAMES <> "REGENA"
30 PRINT "ENTER A NAME."
40 INPUT NAMES
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 enhanceddensity 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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Back issues of COMPUTE!, COMPUTE!'s Gazette, or any magazine disks can be ordered by calling 800-346-6767 (in NY 212-887-8525). Some issues may no longer be available.

# \$15,000.00 Programming Contest! 

## COMPUTE!'s PC Magazine For IBM PCS \& Compatibles

First Prize \$7,500.00<br>Five Honorable Mentions<br>Second Prize \$2,500.00<br>\$1,000.00 each

COMPUTE! Publications, Inc., a longtime leader in personal computer publishing, is launching a new magazine this summer: COMPUTE!'s PC Magazine for IBM PCs \& Compatibles. Each bimonthly issue will include a floppy disk filled with programs, source code, and other useful information. We're looking for the very best original software for IBM PCs, XTs, and compatibles, and are sponsoring a programming contest with a total of $\$ 15,000.00$ in prize money for the top six winners. That's $\$ 7,500.00$ for First Prize; $\$ 2,500.00$ for Second Prize; and five Honorable Mentions at $\$ 1,000.00$ each. In addition, the winners will receive our standard purchase fees for publication in our magazine and royalties if republished in COMPUTE! books.

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

Interested? If so, read these 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 have been either entered in other contests or submitted for publication elsewhere at the same time.
3. The contest deadline is October 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 any programming language-including BASIC, C, machine language, Pascal, and Modula-2-as long as they meet two requirements. First, if you're using a compiled language, the compiled object or runtime code must be a self-standing program that can be run by someone who doesn't own a copy of the language. (Interpreted BASIC is an exception. It can be assumed that nearly everyone owns a copy of BASICA or GWBASIC.) Second, we must be able to legally distribute the program without incurring licensing fees or other obligations to the maker of the language. If you're not sure whether a certain language qualifies, contact its maker for clarification.
6. Entries must be submitted on $5^{1 / 4}$-inch floppy disks. If your program is written in a compiled language, you must submit both the runtime 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 selfaddressed, stamped mailer.
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## 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 512 K , 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 256 K chips. This is not a do-ityourself 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 " $\mathrm{M}^{*} \mathrm{~A}^{*} \mathrm{~S}^{*} \mathrm{H}^{\prime}$ " 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 128 K 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 72hour 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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## 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, dou-ble-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 orly 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 4 K 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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## 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 $\operatorname{crlf}[]=\{13,10,0\}$;
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 $\mid 0 x f f)+1$;
active_page $=$ page $1 ; /^{*}$ Original screen is active */
hidden_page = page2; /* Alternate screen is hidden */
MOUSE_DIE $\quad / *$ Hide mouse for the moment */
Cconws(crlf);
Print_it(msg1); /* Print message on original screen */
Flip( );
/* Flip to alternate screen */
Print_it(msg2); $\quad / *$ and print message there */
Print_it(msg3);
/* Show mouse again */
foo $=1$;
while (foo) /* Endless loop (loop until we break) */
key $=\operatorname{Crawcin}() ; \quad / *$ Wait for keypress */
if (key $==27$ ) break; /* Exit if it's ESC */
else Flip(); /* Flip screens otherwise ... */
\}
Setscreen ( log, page1, -1 L ); /* 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, -1 L );
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 some-
what 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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## 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 $x p o s, y p o s$

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 $x p o s, y p o s$
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 $x$ pos, $y$ pos,what
can be written as
978 POSITION $x p o s, y p o s$ : 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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# 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 highresolution 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 charactersize 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 charac-

Table 2: CTRL Functions

| ASCII value Keys | Result |  |
| :--- | :--- | :--- |
| CHR\$(2) | CTRL-B | Underline on |
| CHR\$(7) | CTRL-G | Bell sound <br> CHR\$(15) |
| CTRL-O | Boldface on |  |
| CHR\$(27) | - or CTRL [ | Send ESCape <br> code |
| CHR\$(130) | none | Underline off <br> CHRS(143) <br> none |
|  |  | Boldface off |

ters 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.

## 64 Eighty <br> 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 memo－ ry for 64 Eighty．Only the first 1000 bytes contain valid color infor－ mation，but this range is also inter－ preted 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 val－ ues 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－reso－ lution bitmap that determines what you see on the screen．This image is normally a representation of the screen codes stored in screen memo－ ry（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 nor－ mally 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 exe－ cute 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 exe－ cutes，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 in－ cludes all high－resolution graphics programs and many machine lan－ guage programs，such as COM－ PUTE！＇s popular SpeedScript word processor，which take you out of the BASIC environment complete－ ly． 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．
Ø8ø1：19 Ø8 Øø Øø 9E 32 3Ø 37 F4 ø8ø9： 36 3A A2 3 A 8F 221414 FB $\begin{array}{lllllllll}\text { Ø811：14 } & 14 & 14 & 14 & 14 & 14 & 14 & \text { ØØ } & \text { ØD }\end{array}$ Ø819：Øø ØØ ØØ АØ ØØ А9 5685 ØС Ø821：Ø3 A9 ø8 85 Ø4 A9 Bø $85 \quad 24$ Ø829：$\varnothing 5$ A9 8B 85 Ø6 A9 8E 8569 ஏ831：FB A9 1885 FC A5 Ø3 E5 6F Ø839：FB A5 Ø4 E5 FC BØ 13 B1 12 Ø841：Ø3 91 Ø5 E6 ø3 DØ Ø2 E6 8C Ø849：Ø4 E6 Ø5 DØ Ø2 E6 Ø6 4C C6 Ø851：36 Ø8 4C BØ 8B 78 A2 øø 96 Ø859：A $\quad 84$ 8C 8A Ø2 8E $2 \emptyset$ DØ $7 \varnothing$ Ø861：8E 21 Dø $8 \mathrm{E} \quad 11 \mathrm{D} \mathrm{\emptyset} \quad 86 \quad 3714$ Ø869：84 $38 \quad 86$ Ø871：FE AØ ØØ B9 øø 8C 99 Øø 2A Ø879：Ø4 C8 DØ F7 EE DØ 8B EE 18 Ø881：D3 8B AC D3 8B C $\emptyset$ Ø8 DØ 71 Ø889：E8 20 33 A5 A4 23 A5 22 F5 Ø891：18 69 Ø2 90 Ø1 C8 85 2D B4 $\begin{array}{llllllllll}\text { Ø899：} 84 & 2 \mathrm{E} & 85 & 2 \mathrm{~F} & 84 & 3 \varnothing & 85 & 31 & 3 C\end{array}$
 Ø8А9：55 $44 \quad 44 \quad 33$ øø Øø $2 \varnothing 156$
 ø8B9：66 $55 \quad 55 \quad 67$ øø øø $2 \varnothing 53 \quad$ Ø7 Ø8C1： 44445423 øø ØØ 6151 D5 ø8C9：53 $55 \quad 55 \quad 67$ øの øø $7 \varnothing 42$ 1D

 Ø8E1：45 $53 \quad 51 \quad 31$ Ø2 005454 B3 Ø8E9：76 $55 \quad 55 \quad 55$ øØ øØ 72 2の 8F Ø8Fl：26 $22222 \quad 77$ Øø $0 \emptyset 1210$ 8D Ø8F9：16 $12 \begin{array}{llllllll}52 & 22 & \emptyset 4 & \text { Øø } & 54 & 65 & 34\end{array}$ ø9ø1：46 $46 \quad 65 \quad 55$ øø øø 464298 Ø9ø9：42 $42 \quad 42 \quad 77$ øø Øø 5075 A2 Ø911：57 $55 \quad 55 \quad 55$ øø øø 5 5Ø 76 3B Ø919：75 $75 \quad 5555$ øø øの $2 \emptyset 52$ D5 Ø921：55 $55 \quad 55 \quad 22$ Øø øø 605617 Ø929：65 $46 \quad 4444 \quad \emptyset 4$ ØØ 2053 FF Ø931：55 $53 \begin{array}{llllllll}71 & 71 & \text { Ø1 } & \text { Ø0 } & 60 & 56 & 27\end{array}$
 Ø941：44 $22 \quad 11 \quad 66$ Øの ØØ $72 \quad 22$ 8D 0949：27 222221 ØØ ØØ 220055 C3 Ø951：55 $55 \quad 55 \quad 33$ Øø øø 5055137
 6961：55 $55 \quad 77 \quad 55$ Øの Øの 5055 AD Ø969：22 $22 \quad 5255$ Øø Øø 5055 AA Ø971：55 $25 \quad 23 \quad 21 \quad$ Ø2 ØØ 7017 F5 6979：21 424477 ØØ ØØ 426644 BD Ø981：44 $44 \quad 44 \quad 66$ Øø Øø $\begin{array}{lllllll}22 & 55 & 4 \mathrm{~F}\end{array}$ Ø989：44 664477 ØØ ØØ 3311 CE Ø991：11 1111133 Øø 1100227781
 Ø9A1：44 FF 44 Øø ØØ Øø Øø Øø 5E 69А9：Øø øø Øø Øø øø Øø 222222 の9B1：22 22 Øø 22 Øø Øø 5555 7F Ø9B9：ØØ øø øø øø øø øø 5577 ED
 Ø9C9：66 11 7722 øø øø 551120
 Ø9D9： 66 EE 9977 ØØ Øø 1122 C9 Ø9E1：ØØ ØØ ØØ Øø ØØ Øø 2244 7C Ø9E9： $44 \begin{array}{llllllll}44 & 44 & 22 & \text { øø } & \text { øø } & 22 & 11 & 2 F\end{array}$ Ø9F1：11 111122 ØØ Øø Øø 55 6A Ø9F9：22 $77 \quad 2255$ øø øø øø 22 B6 ØAø1：22 $77 \quad 22 \quad 22$ Øø ØØ øø øØ 6A ØАØ9：Øø øø 222244 Øø øø Øø A5 ØA11：Øø 77 Øø Øø øø Øø øø øø Ø3 ØA19：Øø Øø 2222 Øø øø 11， 11 C6
 ØА29：77 $77 \quad 55 \quad 22$ Øø øø 22 66 4 E ØА31：22 $222 \quad 22 \quad 77$ Øø Øø $22 \begin{array}{llllll}55 & 34\end{array}$ ØA39：11 $2244 \begin{array}{lllllll}77 & \text { Øø } & \text { Øø } & 77 & 11 & 5 E\end{array}$ ØА41：22 $11 \begin{array}{llllllll}55 & 22 & \text { Øø } & \text { Øø } & 55 & 55 & 77\end{array}$ ØА49：77 111111 Øø Øø 7744 ØA51：66 11 1166 øø øø $33441 \emptyset$ ØA59：66 5555522 Øø øø 7711 C2 ØA61：11 222222 Øø Øø 2255086 ØA69：22 5555522 Øø øø 2255 4A ØА71：55 331166 ØØ Øø Øø 22 A7 ØА79：Øø Øø 22 Øø Øø øø Øø 22 F3 ØA81：ØØ Øø 222244 Øø Øø 11 2F ØА89：22 442211 ØØ ØØ ØØ ØØ 15 ØA91：77 ØØ 77 Øø ØØ ØØ Øø 4494 ØА99：22 $11 \begin{array}{llllllll}22 & 44 & \text { ØØ } & \text { Øø } & 22 & 55 & 25\end{array}$ ØAAl：11 22 Øø 22 øø øø øø øø E8 ØAA9 ：FF FF ØØ Øø ØØ ØØ $22 \begin{array}{llllll}75 & 77\end{array}$ ØAB1：F5 $27 \quad 75 \quad \emptyset 5 \quad \emptyset \emptyset \quad 6 \emptyset \quad 66 \quad 65$ 3D ØAB9： $66 \quad 6565 \quad 66 \quad 6 \emptyset \quad \emptyset \emptyset \quad \emptyset 2 \quad \emptyset 579$ ØACl：F4 F4 Ø5 Ø2 Øø Øø Ø6 F5 5Ø ØAC9：F5 Ø5 Ø5 Ø6 øø ØØ F7 F4 FF ØAD1：Ø6 Ø4 Ø4 07 ØØ ØØ $07 ~ Ø 4 ~ E C ~$ ØAD9：Ø6 F4 F4 Ø4 Øø 404245 D7 ØAE1： $44 \begin{array}{lllllllll}45 & 45 & 43 & 40 & 20 & 25 & 25 & 38\end{array}$ ØAE9：27 $25 \quad 25 \quad 25 \quad 2 \emptyset$ ØØ 07 Ø2 22

 ØВØ1：C4 Ø4 Ø6 Ø5 Øø 8Ø 8484 1B
 ØB11：45 $25 \begin{array}{llllllll}45 & 15 & 10 & 10 & 15 & 27 & 1 B\end{array}$ ØB19：27 $4745 \quad 85$ 8Ø FØ F2 85 C8 ØB21：85 $85 \quad 858280 \quad \mathrm{~F} \emptyset \quad \mathrm{~F} 6 \quad 15 \mathrm{FE}$ $\begin{array}{lllllllll}\text { ØB29：} & 16 & 14 & 14 & 14 & 10 & \text { øø } & 62 & \text { F5 }\end{array} 4 \mathrm{E}$ ØВ31：F5 F5 F7 67 Øø øø Ø6 Ø5 46 ØВ39：Ø6 Ø5 F5 F5 øø øø 52 F5 4C ØB41：F4 F2 7126 Øø $4 \varnothing 4742$ Fø ØВ49：42 $42 \quad 42 \quad 42 \quad 4 \emptyset \quad$ Øø 05 Ø5 8 EE ØB51： $0515 \begin{array}{llllllll}15 & 25 & 43 & 40 & 9 \varnothing & 95 & 95 & \text { ØD }\end{array}$ ØB59：65 $65 \quad 95 \quad 92$ 9Ø Øø 65 F5 9C ØB61：95 95 F7 65 ØØ $6065 \quad 95$ DE ØB69：92 6265 F5 Øø $2 \emptyset 25 \quad 25$ 5D ØB71：25 $22 \quad 22 \quad 22 \quad 20 \quad 0 \emptyset \quad 47$ El 7A

のB79：F2 F4 E4 47 øø $66 \quad 666624$ ØB81：FF FF 666666 A5 42 A5 BE ØB89：42 A5 42 A5 42222222 CD ØB91：22 22222222 ØA 65 1A 05 ØB99：F5 5A 55 5A 65 F5 F2 75 EC ØBA1：72 35321512 øø øø øø 66 ØВA9：Øø øø Øø øø øØ CC CC CC 59 ØBBl：CC CC CC CC CC øø øø $\varnothing \varnothing 2 \mathrm{E}$
 ØBC1：øø øø øø øø øø øø øø øø D7 ØBC9：øø Øø øø øø FF 888888 9B ØBD1：88 88888888 AA 55 AA 2 C ØBD9：55 AA 55 AA 55111111 BC ØBEl：11 11111111 øø øø øø 80 ØBE9：øØ AA 55 AA 55 F5 F2 E5 4E
 ØBF9：11 11111111 CC CC CC 32

 ØC11：33 øø øø øø øø øø øø øø С2 øC19：øø EE 222222 øø øø øø 64 ØC21：Øø Øの Øの FF FF Øø øø øø 39 øC29：øø $3322 \quad 22 \quad 22 \quad 2222$ FF 52 øC31：FF øø øø øø øø øø øø øø 49 ØC39：øø FF FF 2222111111 FB ØC41：FF FF $111111 \mathrm{CC} C \mathrm{CC} \mathrm{AE}$ øC49：CC CC CC CC CC EE EE EE 5ø ØC51：EE EE EE EE EE $33 \quad 33 \quad 3347$ ØC59：33 $33 \quad 33 \quad 33 \quad 33 \mathrm{FF}$ FF øø øB ØC61：Øø øø øб øø øø FF FF FF 79 øC69：øø øø øø øø øø øø øø øø 81 ØC71：øø Øø FF FF FF 111112 Ø2 ØC79：12 14 1C FC FC Øø Øø Øø DA ØC81：øø Øø EE EE EE 77777722 ØC89：øの øø øの øの øб $2222229 \varnothing$ ØC91：EE Øб øø øø Øø EE EE EE A9 ØC99：øø øø øø øø øø EE EE EE 3A
 ØCA9：93 1F 93 4A F3 91 F2 ØE 44 ØCB1：F2 50 F2 33 F3 8393 A3 61 øCB9：94 ED F6 3E Fl 2F F3 66 F4 øCCl：FE A5 F4 ED F5 9B 7A 9B EE ØCC9：87 99 BD 9B 8499 EF 9 B 83 ØCD1：7F 929698 EE 9B B8 9B 9D ØCD9： B 9 9B 7899 BD 9 B 82 9B 5B ØCE1：AE 9B 7D $92 \quad 8797$ DA 9B FC ØCE9：A6 974696 FD $9726979 F$ ØCF1： 03 9A ØA 99 A4 99 AA 9785 ØCF9：1Ø 97 ØA 9A $72 \begin{array}{lllllll}97 & 89 & 97 & 87\end{array}$ ØDø1：8Ø 97 D3 97 CD 99 E2 9767 ØDø9：91 97 6A 99 B6 97179994
 ØD19：日7 ØD ØF $11 \begin{array}{llllll}12 & 13 & 14 & 1 B & \text { øD }\end{array}$
 ØD29：1D $4 \varnothing 414243444546$ 2A ØD31： 4748494 A 4 B 4 C 4 D 4 F 44 ØD39：50 515354555657 1B 4D ØD41：øø øø øø øø øø øø øø øø 5B ØD49：øの øø øø øø øø øø øø øø 63 ØD51：øø øø 37 øø øø øø ø8 øø 62 ØD59：38 ØF øø øø øø øø øø øø 53 ØD61：øø øø Ø1 Ø2 Ø3 ø4 øø Ø1 E4 ØD69：ø2 ø3 Ø4 Ø5 ø6 ø7 4C Aø 9B ØD71：A1 A2 A3 A5 A6 A7 A8 AA A3 ØD79：AB AC AD AF Bø B1 B2 B4 AB ØD81：B5 B6 B7 B9 BA BB BC BE B3 ØD89：øø $4 \varnothing 8 \emptyset$ Cø øø $4 \varnothing 8 \varnothing$ Cø 92 ØD91：$\varnothing \varnothing 4 \varnothing 8 \varnothing$ Cø øø $4 \varnothing 8 \varnothing$ Cø 9A ØD99：øø $4 \varnothing 8 \varnothing$ Cø øø $4 \varnothing 8 \varnothing$ Cø A2 ØDA1：øø $84 \quad 84 \quad 84 \quad 848585858 \emptyset$ ØDA9：86 $868687878788 \quad 88$ E5 ØDB1：88 898989898 8A 8A 8A 52 ØDB9：8B 8B øø $5 \emptyset$ Aø Fø $4 \varnothing 9 \emptyset 5 B$ ØDCl：EØ 3080 DØ $2 \varnothing 7 \varnothing$ C 10 C9
 ØDD1：EØ $30808 \mathrm{C} 8 \mathrm{C} 8 \mathrm{C} 8 \mathrm{8C} 8 \mathrm{C} 7 \mathrm{D}$ ØDD9：8C 8C 8D 8D 8D 8D 8D 8D 33 ØDE1：8E 8E 8E 8E 8E 8E 8E 8F FC ØDE9：8F 8F 8F 8F øø 28507854 ØDF1：AØ C8 FØ $184 \varnothing 689 \varnothing$ B8 AB ØDF9：Eの $08 \quad 3 \varnothing 5880$ A8 Dø F8 53 ØEØ1：2Ø $487098 \mathrm{C} \varnothing 2 \varnothing \mathrm{FE} 91 \mathrm{EC}$ ØEØ9：AØ ØØ A9 1785 D6 Cø 5176 ØE11：DØ Ø4 A9 $2 \emptyset 85$ D3 B9 8643

ØE19：91 2ø AB $94 \mathrm{CB} \mathrm{C} \varnothing 67 \mathrm{D}$ D AD $\emptyset E 21: E D$ A2 3 B 8E AC $9 \varnothing 8 \mathrm{E} 11$ Ø3 ØE29：Dø 58 6ø ØE $2 \varnothing 16 \begin{array}{llllllll}36 & 20 & 13\end{array}$ ØE31：65 69676874792942 D9 ØE39：59 2の 6A 6566667265 C 4 ØE41：79 $2 \varnothing 64$ 2E $2 \varnothing 7 \varnothing 617289$ ØE49：74 63 68 2E $2 \varnothing$ C3 $4 F 5 \varnothing 67$ ØE51：59 $52494947485420 \quad 2848$ ØE59：43 $2920 \quad 313938372 C$ BD ØE61：2の 63 6F 6D $7 \varnothing 757465$ D2 ØE69：21 $2 \varnothing 7055424 \mathrm{C} 4943$ 9A ØE71：41 $54 \quad 494 \mathrm{~F} 4 \mathrm{E} 53 \mathrm{2C} 2 \varnothing 99$ ØE79：49 4 E 43 2E $614 \mathrm{C} 4 \mathrm{C} 2 \varnothing \quad$ ØE ØE81：52 $49 \begin{array}{llllllll} & 47 & 48 & 54 & 53 & 2 \emptyset & 52 & \text { 99 }\end{array}$ øE89：45 53 $45 \begin{array}{llllll}52 & 56 & 45 & 44 & 2 \mathrm{E} & 69\end{array}$ ØE91：13 8E A2 18 A9 øø 86 E4 EF ØE99：85 E3 85 E5 A9 4F 85 E6 FC ØEA1：A9 13 6ø A2 øø Aø $9 \varnothing 2 \emptyset 51$ ØEA9：19 FD A9 7F 8D 6D DC 8D E6 ØEB1：øD DD 8D øø DC A9 ø8 8D A8 ØEB9：ØE DC 8D ØE DD 8D ØF DC C6 ØEC1：8D ØF DD A2 øø 8E ø3 DC 6B ØEC9：8E 03 DD 8E 18 D4 CA 8E CA ØED1：Ø2 DC A9 $952 \varnothing$ CD FD Aø 89 ØED9：1ø A9 øø 99 D9 øø 88 1ø Fl ØEE1：FA A9 84 8D 88 Ø2 A9 03 F1 ØEE9：85 9A A9 øø 8599 AØ 2E A6 ØEF1：B9 9B 9ø 99 øø Dø 88 1ø El ØEF9：F7 A9 øø 8D 91 ø2 85 CF C4 ØFØ1：A9 48 8D 8F ø2 A9 EB 8D CC ØFø9：9ø ø2 A9 ØA 8D 89 ø2 8D E9 ØF11：8C Ø2 A9 ø3 8D 86 Ø2 A9 8F ØF19：ø4 8D 8B Ø2 A9 øC 85 CD 84 ØF21：85 CC 26 ED 91 AD 21 Dø 6E ØF29：29 ØF 85 DD 2ø 6D 9B A6 C2 øF31：E4 2ø 3B 9A CA $3 \varnothing$ Ø4 E4 DE ØF39：E3 B6 F6 A5 E5 85 D3 A5 41 ØF41：E3 85 D6 A6 D6 BD CA $9 \varnothing$ CB ØF49：85 F2 BD E3 $9 \varnothing 85$ F1 BD 19 ØF51：FC $9 \varnothing 85$ D2 BD 159185 DA ØF59：D1 BD 2E 9185 F4 BD 4771 ØF61：91 85 F3 A5 D3 29 FE F6 B4 ØF69：ø8 4A A8 $2 \varnothing 9 \varnothing 9588$ Dø F1 0F71：FA A5 F1 85 EF A5 F2 858 E ØF79：F0 60 8A 48 A5 D3 48 A5 Bø øF81：E6 85 D3 $2 \varnothing$ Aø 92 Aø $\varnothing 7$ 88 ØF89：A9 øø 91 F1 8810 FB $2 \varnothing$ 6A ØF91：9C 95 A4 D3 A9 $2 \varnothing$ 91 D1 F7 ØF99：88 91 D1 $2 \emptyset$ ØD 93 C4 E5 C2 6FA1：F6 658884 D3 10 DF 68 D9 ØFA9：85 D3 68 AA A9 8ø 9D D1 93 ØFB1：8B $6 \varnothing 98484 \mathrm{~A}$ A8 AD 86 1C ØFB9：Ø2 ØA ØA ØA ØA 05 DD 91 EE ØFC1：F3 68 A8 6048 8A 48 98 A4 øFC9：48 A9 7F 8D øD DD AC øD 85 ØFD1：DD $3 \varnothing 1620$ Ø2 FD Dø Ø3 5C ØFD9：6C Ø2 8ø $2 \varnothing$ BC F6 $2 \varnothing$ El A4 ØFE1：FF Dø 0620 FE 916 C Ø2 10 ØFE9：AØ 4C 72 FE A9 1485 CC 1 F ØFF1：AD 21 Dø 29 ØF C5 DD Fø 18 ØFF9：17 85 DD A5 F3 48 A5 F4 1C 1øø1：48 A2 9ø Aの E8 CA EØ 8B C9 1009：DØ 696885 F4 6885 F3 81 1011：4C 31 EA 8884 F3 86 F4 7F 1019：Aø øø B1 F3 29 FØ 05 DD F3 1021：91 F3 A4 F3 FØ DF Dø EB 6F 1029：A5 99 Dø ØA A5 D3 85 CA 8F 1031：A5 D6 85 C9 10 ØF C9 Ø3 7A 1039：DØ 0885 DØ A9 4 F 85 CB DF 1ø41：Dø Ø3 4C 73 Fl 9848 8A 58 1049：48 A5 DØ FØ $662 \varnothing$ 9E 92 A3 1051：A4 D3 B1 D1 85 D7 29 3F 29 1059：ø6 D7 24 D7 10 Ø2 ø9 80 8F 1ø61：9Ø Ø4 A6 D4 Dø $8470 \quad$ Ø2 66 1ø69：ø9 4Ø E6 D3 $2 \varnothing 84$ E6 A6 BF 1071：D6 E4 E8 D9 21 C4 C8 Fø FE 1079：06 C4 E6 90 23 Fø 21 Aø 73 1ø81：øø 84 Dø A9 øD A6 99 Eø 8E 1089：ø3 Fø ø6 A6 9A Eø ø3 Fø E1 1ø91：ø3 $2 \varnothing$ AB 94 A9 ØD C4 E6 EB 1ø99：Dø Ø6 E6 D6 A4 E5 84 D3 87 10A1：85 D7 68 AA 68 A8 A5 D7 3B 1øA9：C9 DE Dø Ø2 A9 FF 18607 E $1 \emptyset B 1: 2 \varnothing$ AB 94 A5 C6 Dø $\varnothing 52 \varnothing$ 5D

1øB9：17 9B 9ø F7 78 A5 CF Fø C8 1øC1：ø3 2ø 2B 9B $2 \varnothing$ B4 E5 C9 F3 1øC9：5F Dø ø2 A9 1B C9 83 Dø $8 \emptyset$ 1øD1：16 78 A2 9986 C6 BD E6 AE 1øD9：EC 9D 76 Ø2 CA Dø F7 Fø 41 1øE1：D2 C9 ØD Dø CB 85 Dø Aø 43 1øE9：øø 84 D4 A4 E5 84 D3 $2 \varnothing 19$ 1øF1：65 94 A5 C9 C5 D6 D $\emptyset$ ØF 75 1øF9：A4 CA 84 D3 E4 D6 Dø $\varnothing 718$ 11ø1：C4 C8 9ø ø3 4C DA 93 4C 3B 1109：A8 93 A6 D6 E4 E3 Fø 0847 1111：BD D1 8B 3ø ø3 CA Dø F4 D4 1119：86 D6 E4 E4 F6 øC E8 BD 66 1121：D1 8B 1ø F6 ø9 8ø 9D D1 D7 1129：8B CA 86 E8 $2 \varnothing$ AØ 92 A4 $7 \varnothing$ 1131：E6 C8 88 B1 D1 C9 2ø Dø EB 1139：ø8 C4 E5 DØ F5 E4 D6 DØ 1C 1141：E3 C8 84 C8 60 4C D5 F1 76 1149：48 A5 9A C9 Ø3 Dø F6 68 9A 1151：48 85 D7 8A 489848784 A 1159：A5 CF Fø ø3 $2 \varnothing$ 2B 9B A5 1B 1161：01 4829 FE 85 Ø1 2ø 9E 3A 1169：92 A9 øø 85 D 9 A4 D3 A6 FE 1171：E7 A5 D7 85 E7 Eø 1B Dø ØE 1179：øA A2 11 8E 6F 95 A2 2893 1181：2の 6895 EØ 13 Dø 07 E4 5D 1189：E7 Dø Ø3 $2 \varnothing$ ED 91 AA $3 \varnothing 71$ 1191：44 C9 $2 \varnothing$ BØ 2E C9 1B Fø 17 1199：15 C9 ØD FØ 11 A6 D8 Dø ØF 11A1：ø8 C9 14 Fø Ø9 A6 D4 FØ 49 11A9： 65 ø6 E7 4C $7 \varnothing 96$ A2 FF B4 11B1：8E 6 F 95 A2 $092068 \quad 95 \quad$ Ø3 11B9：2ø CB E8 A8 $68 \quad 85$ б1 98 7A 11C1：4C 44 EC C9 6ø 9ø ø3 29 C9 11C9：DF 2 C 11D1：6C 96 4C 6A 9629 7F C9 22 11D9：7F Dø Ø2 A9 5E C9 2ø Bø D5 11E1：F1 C9 ØD Fø 11 A6 D4 Dø BD 11E9： 68 C9 14 Fø ø9 A6 D8 Fø 99 11F1：Ø5 99 4ø 4C $7 \varnothing 96$ A2 99 D1 11F9：8E 6F 95 A2 $112 \varnothing 6895$ 8B 1201：$\varnothing 9 \quad 80 \quad 20$ CB E8 A8 $68 \quad 85 \mathrm{CA}$ 12ø9： 61 98 4C 4F EC DD 72 9の A6 1211：FØ Ø6 CA Eの FF DØ F6 6ø 28 1219：68 68 8A ØA AA BD $2 \varnothing$ 9ø 9A 1221：8D 8695 BD 2190 8D 8528 1229：95 20 FF FF 6885 Ø1 20 9B 1231：9E 92 4C A8 E6 A5 Fl 1827 1239：69 ø8 85 F1 9ø ø2 E6 F2 31 1241：60 A5 F1 38 E9 0885 Fl 2D 1249：Bø ø2 C6 F2 $6 \varnothing 689848$ 6C 1251：A5 D3 29 FE 85 D3 $2 \varnothing$ 9E AC 1259：92 68 A8 24 DA $10 \quad 03$ A9 FE 1261：Dø 2C A9 D8 85 F2 A9 øø 97 1269：85 F1 FØ ø3 $2 \varnothing 90958812$ 1271：DØ FA A9 7F 8D ØD DC A5 E9 1279：ø1 4829 FB 85 Ø1 Aø 07 8D 1281：B1 Fl 24 D9 10 ø2 49 FF 38 1289：91 EF 88 10 F3 $6885 \quad 61$ D1 1291：A9 81 8D ØD DC A4 D3 2ø AE 1299：ØD 9320 D9 9668684 C 3E 12A1：B3 $96 \quad 48 \quad 29$ 7F A8 C8 AD BE 12A9：18 Dø 29 ø2 Dø Ø3 A9 Fø 2A 12B1：2C A9 $\begin{aligned} & \text { ØF } \\ & 85 \\ & \text { DA } \\ & 24 \\ & \text { DE } \\ & 30 \\ & E 5\end{aligned}$ 12B9：94 A9 øø 85 F1 A9 Ø4 85 AE 12C1：F2 Dø Ø3 $2 \varnothing 9 \varnothing 9588$ DØ B2 12C9：FA 68 A4 D3 91 D1 9848 A4 12D1：Aø 0729 Ø1 Fø 1B Bl F1 86 12D9：25 DA 24 DA 1064 4A 4A E8 12El：4A 4A 85 DB Bl EF 29 FO BC 12E9： 65 DB 91 EF 8810 E 7 3ø 3D 12F1：19 Bl F1 25 DA 24 DA 30 EC 12F9：ø4 ØA ØA ØA ØA 85 DB Bl 54 13ø1：EF 29 ØF 65 DB 91 EF $88 \quad 29$ 13ø9：10 E7 68 A8 4C øD 93 Ø9 8F 1311：4ø A6 C7 Fø ø4 ø9 $8 \emptyset 85$ D3 1319：D9 24 Eø $1 \varnothing$ ø8 $48 \quad 2 \varnothing$ DA $C E$ 1321：97 2ø 9E 9268 2б FD 95 6D 1329：24 D9 10 13 A5 El $48 \quad 2979$ 1331：Øø 85 E1 2ø 2B 9B $6885 \quad 15$ 1339：El A9 øø 85 CF F6 19 A5 2D 1341：DF Fø 15 Aø 67 A5 D3 29 DF 1349：ø1 Fø ø3 A9 øF 2C A9 Fø 94 1351：85 DA B1 EF 45 DA 91 EF CE


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 13B1:E2 $998 \emptyset 30 \quad 44$ A5 E2 2944 13B9:7F 85 E2 60 A6 D6 86 E3 E4 13C1:A5 D3 29 FE 85 D3 85 E5 31 13C9:4C 6D 9B A6 D6 86 E4 A5 8 F 13D1: D3 99 Ø1 85 D3 85 E6 4C 6B 13D9:6D 9B 686868850168 F4 13E1:A8 68 AA 68 A9 5 F 85 E 7 Cl 10 13E9:4C AB 94 A5 D3 48 A6 E4 FF 13F1:E8 CA E4 D6 Fø $652 \emptyset$ D5 FA 13F9:92 30 F6 6885 D3 A5 D3 75 14ø1:85 D5 A4 E6 20 BB 9788 øC 1409:30 04 C4 D5 Bø F6 60 A5 Ø8
 1419:A6 E8 E4 D6 F6 Eø C6 E8 5A 1421:20 D5 9230 F3 206594 A3 1429:88 86 D6 4C D9 96 2б 65 A5 1431:94 A5 E5 85 D3 60 A5 D6 64 1439:48 $2 \emptyset 6594$ A5 D6 85 E8 FF 1441:68 85 D6 A6 E8 E4 D6 F6 BD 1449: 07 E6 E8 20 D5 92 3ø F3 1B 1451:A4 D3 C8 84 D5 A4 E5 $2 \emptyset \quad 4 \mathrm{~F}$ 1459: BB 97 C8 C4 D5 90 F8 $6 \varnothing$ ED 1461:84 D3 46 DE 20 9E 92 A9 C1 1469:20 2ø FD 95 Ø6 DE A4 D3 8B 1471:60 60 A5 E9 Ø9 80 30 Ø4 E3 1479:A5 E9 29 7F 85 E9 60 A6 47 1481:D6 $2 \varnothing 7594$ A6 D6 A4 D3 C2 1489:CA E8 BD FC $9 \varnothing 85$ D2 BD D6 1491:15 9185 D1 88 C8 B1 D1 13 1499:C9 2ø Dø øD C4 E6 Dø F5 F2 14A1:A4 E5 E4 E8 Dø E3 E6 D8 7D 14A9:60 A5 D3 48 A5 D6 48 A5 29 14B1:E8 85 D6 86 E8 AA A5 C8 F8 14B9:84 C8 A8 88 84 D3 24 E9 99 14C1:3ø 19 E4 E4 Dø 15 C4 E6 7E 14C9:DØ 1168 C5 E3 FØ Ø3 3829 14D1:E9 Ø1 48 A5 E8 C5 E3 FØ A9 14D9:ø2 C6 E8 2ø D9 9690 ø3 21 14E1:4C C5 98 C4 E5 Dø $342 \varnothing$ FB 14E9:9E 92 BD D1 $8 \mathrm{~B} \cdot 29 \mathrm{BF} 9 \mathrm{D}$ F8 14F1:D1 8B A5 D1 85 EC A5 D2 B5 14F9:85 ED A5 F1 48 A5 F2 48 3B 15ø1:A4 E6 84 D3 C6 D6 $2 \varnothing$ 9E 75 1509:92 6885 FO 6885 EF A4 34 1511:E6 B1 D1 A4 E5 91 EC AØ 8F 1519:ø7 Dø 27 2ø 9E 92 A4 D3 3E 1521:88 B1 D1 C8 91 D1 $8898 \quad 40$ 1529:85 D3 29 Ø1 DØ ØF AØ Ø7 4B 1531:B1 Fl 4A 4A 4A 4A 91 Fl 2F 1539:88 10 F5 3018 20 9C 95 7D 1541:AØ 07 B1 F1 48 ØA ØA ØA 5B 1549: ØA 11 EF 91 EF 6829 FØ 38 1551:91 F1 88 10 ED A6 D6 A4 2F 1559:D3 E4 E8 Dø 04 C4 C8 Fø 86 1561: 03 4C 3E 98 E6 D8 A9 2ø 7F 1569:91 D1 68 85 D6 6885 D3 6 D 1571:4C 9E 92 E4 E3 Fø 19 C6 E5 1579: D6 A5 E6 85 D3 20 9E 92 9C 1581:AØ $\emptyset 7$ B1 F1 29 FØ 91 F1 35 1589:88 10 F7 A4 E6 4C $9 \mathrm{~F} \quad 9986$ 1591:4C A6 9B A6 D6 $20 \quad 7594 \quad 2 \emptyset$ 1599: C6 C8 A5 C8 A4 D3 A6 D6 33 15A1:C4 E5 Dø 17 E4 E8 DØ ØA A9 15A9:C5 E5 Dø Ø6 B1 D1 C9 2ø 33 15Bl:FØ CL BD D1 8B 3Ø BC A4 D4 15B9:E6 C8 CA 8884 D3 86 D6 C2 $15 \mathrm{Cl}: 20$ 9E 92 A5 D3 48 A5 D6 32 15C9:48 A4 D3 C4 E6 DØ 28 A5 78 15D1:D1 85 EC A5 D2 85 ED A5 6C 15D9:F1 48 A5 F2 48 A5 E5 85 1D 15E1:D3 E6 D6 20 9E $9268 \quad 85 \quad 22$ 15E9:FØ 6885 EF A4 E5 Bl Dl 48 15F1:A4 E6 91 EC 4C 7199 C8 4D

15F9:84 D3 B1 D1 8891 D1 9875 16ø1:29 Ø1 Dø ØF Aø 97 Bl F1 83 1609: ØA ØA ØA ØA 91 Fl 881014 1611:F5 $3 \varnothing 1 \mathrm{E} 2 \varnothing 9 \varnothing 95$ Aø 97 2D 1619: Bl EF 29 Fø 85 DB Bl Fl 3 F $1621: 484 \mathrm{~A} 4 \mathrm{~A} 4 \mathrm{~A} 4 \mathrm{~A} \quad 65 \mathrm{DB} 91 \mathrm{Al}$ 1629:EF 6829 øF 91 F1 88 10 F2 1631:E7 2ø 9E 92 A4 D3 E4 E8 7D 1639: Dø 91 C4 C8 9ø 8D 688568 1641:D6 6885 D3 A9 2091 D1 A3 1649:60 A5 E1 ø9 8ø 3ø 1ø A5 66 1651:E1 29 7F 1ø ØA A5 E1 99 5D 1659: Ø7 Dø Ø4 A5 El 29808552 1661:E1 60 A6 D6 E4 E3 Fø ØD 7E 1669: BD D1 8B $3 \varnothing$ ø8 øA $1 \varnothing$ ø5 EA 1671:9D D1 8B C6 D6 $2 \varnothing$ EF 996 F 1679:E4 E3 FØ ø5 BD D1 8B $1 \varnothing$ DB 1681:F4 86 D6 A4 E5 84 D3 Aø 78 1689:øø 84 D8 84 C7 84 D4 84 B8 1691:DF 84 DE 60 A6 D6 A5 D3 $6 \varnothing$ 1699:E8 E4 E4 9ø ØF Fø ØD A6 16 16A1:E3 24 E9 3067482015 B7 16A9:9A 6885 D3 86 D6 60 A6 22 16B1:D6 8A $482 \varnothing 15$ 9A $68856 \varnothing$ 16B9:D6 $6 \varnothing 86$ D6 E4 E4 Fø $2 \emptyset 64$ 16 Cl :8A $998 \emptyset$ 8D D $\varnothing$ 8B $2 \varnothing$ A7 FA 16C9:9A E4 E4 Dø F9 AD Dø 8B D9 16D1:29 7F AA E8 BD D1 8B CA 6D 16D9:9D D1 8B E8 E4 E4 Dø F3 99 16E1:A5 E5 85 D3 4C D5 92 A5 CC 16E9:D6 48 A5 D3 A6 E3 $2 \varnothing$ øø 8A 16F1:9A 6885 D6 60 A6 E4 E4 EF 16F9:E3 Fø E5 86 D6 2ø A7 9A 9A 17ø1:EC DØ 8B DØ F8 A6 E4 CA 4F 17ø9:BD D1 8B E8 9D D1 8B CA Aø 1711:EC Dø 8B Dø F2 Fø C9 A6 FD 1719:D6 BD D1 8B 994048 E4 D3 1721:E4 FØ ØA 8E DØ 8B 8A 48 3A 1729:2Ø 5ø 9A 68 AA 86 D6 $2 \varnothing 92$ 1731:D5 9268 9D D1 8B 60 A5 F8 1739:D6 48 A5 D3 48 A5 E3 8D 65 1741:DØ 8B $2 \varnothing$ 5ø 9A $68 \quad 85$ D3 19 1749:68 85 D6 6ø A5 E6 85 D5 97 1751:85 D3 A6 D6 20 Aø 92 A5 C7 1759:F1 48 A5 F2 48 A5 F3 85 BC 1761:EA A5 F4 85 EB A5 D1 8584 1769:EC A5 D2 85 ED 2C DØ 8B 77 1771:3ø Ø2 CA CA E8 86 D6 $2 \varnothing$ 6D 1779:Aø 926885 F2 6885 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 Aø 67 B1 EF 26 1799:91 Fl 88 10 F9 A5 EF 38 9D 17Al:E9 ø8 85 EF Bø 02 C 6 F 082 17A9:2Ø 9C 95 A5 D5 C6 D5 4A DB 17B1:A8 Bl F3 91 EA CA 10 CF AA 17B9:A6 D6 1860 C6 DC Dø 5095 17C1:C6 CD Dø 4C A9 1685 CD 24 17C9:A5 E1 100424 CF $3 \varnothing 4086$ 17D1:A5 014829 FE 8501 A5 64 17D9:D3 A8 29 Ø1 Fø 0488 A9 A3 17E1:øF 2C A9 Fø 8D 5A 9B B1 A5 17E9:D1 C9 2ø Dø ØA C8 Bl D1 2D 17F1:C9 $2 \emptyset$ DØ $\emptyset 3$ 2ø ØD 93 A5 59 17F9:E1 29 7F A8 Bl EF 49 FD AE 18ø1:91 EF C8 Cø Ø8 Dø F5 A5 3ø 1869:CF 49 FF 85 CF $68 \quad 85 \quad 61$ F7 1811:18 60 A2 18 A9 80 9D D1 97 1819:8B CA 10 FA $6 \emptyset$ A9 $\varnothing \emptyset ~ 85 ~ A 2 ~$ 1821: DF 60 A9 øø 85 C7 60 A9 44 1829:øø 85 DE $6 \varnothing 24$ E2 $3 \varnothing$ 1A C3 1831: Aø 2Ø A2 Ø9 A9 17 8E 65 6A 1839:D4 8E Ø6 D4 8D 18 D4 ØA 06 1841:8D Ø1 D4 8C 64 D4 C8 8C 6D 1849:ø4 D4 609888 C5 E5 DØ 9 E 1851: ØA A4 E6 A6 D6 E4 E3 F6 F9 1859:ø4 C6 D6 84 D3 $6 \emptyset 98$ C8 7A 1861:C5 E6 Dø ø5 20 EF 99 A4 31 1869:E5 84 D3 6ø A5 14 48 A5 E1 1871:15 48 2ø F7 B7 A5 Ø1 48 6ø 1879:29 FE 85 Ø1 AØ øØ B1 14 3B 1881:A8 $68 \quad 85 \quad 0168 \quad 85 \quad 15 \quad 68$ CC 1889:85 14 4C A2 B3 øø øø øø D2

Sign Here

# 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 40column screen? With a disk drive and Atari DOS, you need only make an AUTORUN.SYS file to change the screen settings at pow-er-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.

## Baich 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 state－ ments into memory．Type and run the following program to create a text file named DOSTUFF：
1ø OPEN \＃1，B，$, " D: D O S T U F F$
2の PRINT \＃1；＂POKE 71の，$\varnothing "$ 3ø PRINT \＃1；＂POKE 82，${ }^{\circ}$ 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 exe－ cute 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 col－ umns，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 de－ vice．The computer reads and exe－ cutes 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（In－ put／Output Control Block）．It per－ forms the equivalent of these two BASIC lines：

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

Location 180 ordinarily con－ tains a zero，referring the IOCB 0 ， which the operating system re－ serves for the screen editor．Replac－ ing 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＂COMPUTEI＇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 日 PRINT＂\｛3 SPACES\}All Ri ghts Reserved．＂
ED 1 D FOR $X=1$ TO 1øøø：NEXT $X$
LC 25 DIM A（1），LINE（12g）： 0 PEN \＃2，12， H，＂E：＂：POKE $^{\text {W }}$ 82，Ø：？＂\｛TAB\} Biesich Bitu CH FITHE MAKEE＂：？
JC $3 \varnothing$ ？＂This program willa llow you to create＂：？ ＂an AUTORUN．SYS \＆AUTO RUN．BAT file that＂
MN 4ø ？＂will execute a seri es of BASIC commands＂： ？＂whenever you turn y our system on．＂
LP 5\％？：？＂Insert a diskett e and HIT＜RETURN＞to＂ ：？＂create the AUTORUN ．SYS file．＂；
PN G $\emptyset$ INPUT A \＃1，4， 9 ，＂D：AUTURUN．SYS ＂：GOTO 日の
CA Bø CLOSE \＃：？＂AUTORUN．SY S ALREADY EXISTS！＂：？＂ Would you like to over write it（Y／N）＂；
CP 85 INPUT $A 末: I F A \$=" Y$＂THE N $15 \mathscr{}$
AA 9 IF IF $A \$<>" N "$ THEN $8 \varnothing$
AM 95 GOTO 5ロ
AK 1 Øø IF PEEK（195）＜＞17 7 THE N 49g
DA 15 ？＂Creating AUTORUN． S YS．．．＂：TRAP 4 ■ø
II 169 CLOSE 1 ：OPEN 解1， 8 ，$\curvearrowleft$ ， ＂D：AUTORUN．SYS＂：RESTO RE
L6 170 READ $N: I F N>-1$ THEN $P$ UT \＃1，N：GOTO 17 D
 ＂D：AUTORUN．BAT＂：？：？ ：？＂AUTORUN．BAT ready for input．．．＂：？
FH210 ？＂Now enter any stat ements／commands you＇d ＂：？＂like executed at start－up．＂

61 220 ？＂（Enter just a＜RET URN＞when done．）＂
B 25．POKE 694，D：POKE 792，6 4：？＂ENTER A LINE：＂：I
 1；LINE $⿻$ ：IF LINE象く〉＂＂ THEN 25！
 ？＂BATCH file created ！＂：？＂Boot disk to tr $y$ it out．＂：END
CE 4øø ？＂\｛BELL\} ERROE - ";PE EK（195）：CLOSE 1：CLOS E 粠2：STOP
PK 5øø DATA 255，255， $5,6,219$ ， $6,169,1,133,9,169,6,1$ $41,68,2,169$
K6 510 DATA 135，32，199，6，165 ，156，2玉1，161，176，7，17 3，96，169，261，165， 246
LJ 529 DATA $5,169,156,76,199$ ，6，173，75，3，133，294， 1
$73,71,3,133,295$
BJ 53 DATA $169,54,141,7 \%, 3$ ， $169,6,141,71,3,198,25$ 6，191，165，264，141
LJ 54 DATA 7 ． $5,165,265,141$ ，71，3，162，112，169，3，1 $57,66,3,169,286$
BJ 55® DATA $157,68,3,169,6,1$ $57,69,3,169,4,157,74$ ， 3，32，86，228
FM 566 DATA $16,19,192,170,26$日，212，169，184，32，169， $6,96,169,7,133,186$
BD 57 D DATA $76,96,166,162,6$ ， $157,68,3,169,6,157,69$ ，3，157，73，3
DC 589 DATA $169,9,157,66,3,7$ $6,86,228,125,89,114,1$ 11，99，191，115，115
HK 59ø DATA $195,11 \emptyset, 1 ø 3,32,9$ 8，97，116，99，104，32，16 2,1 פ5，198，1ø1，46，46
NH 6 Dの DATA $46,155,76,1 \not 1,1 \emptyset$ $1,195,32,66,65,83,73$ ， $67,32,49,114,191$
J661ஜ DATA $118,46,32,65,44$ ， $66,44,111,114,32,67,4$ $1,46,155,66,97$
OE 62ø DATA 116，99，104，32，10 $2,105,108,101,32,110$ ， $111,116,32,102,111,11$ 7
IF 636 DATA $115,109,46,155,6$ $8,58,65,85,84,79,82,8$ 5，78，46，66，65
HE 64 DATA $84,155,224,2,225$ ，2，5，6，－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 16color 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 pat－ terns．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 dif－ ferent 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－Carte－ sian 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 avail－ able on the ST．PAUSE holds the image on the screen for a few mo－ ments，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 bor－ ders to change colors during the ani－ mation 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 sub－ routine．The picture seems to disap－ pear．One by one，individual lines are＂turned on＂with cyan，and ＂turned off＂with black，by alter－ nately calling the BLUES and BLACKOUT subroutines while stepping through the 14 color pal－ ettes．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 but－ ton to run the program again or on the QUIT button to abort．Quitting the program clears and then closes the output window before the pro－ gram 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． |
| :---: | :---: |
| 29 | ＇All Rights Reserved |
| 70 | dim Old\％（16，3）：＇array for color values |
| 80 | if peek（systab）$=4$ then go to MathGraphics |
| 96 | goto MEDIUMRES |
| 106 | MathGraphics： |
| 110 | gosub COPYRIGHT |


| $12 \square$ | gosub RECORD |
| :---: | :---: |
| $13 \emptyset$ | gosub INITIALIZE |
| 149 | ＇Module 1：RightOvals－－ |
| 150 | R1＝14ø |
| $16 \square$ | R2＝20 |
| $17 \emptyset$ | $\mathrm{R} 3=25$ |
| 189 | R4＝65 |
| 190 | Inc＝Pi／ 64 |
|  | for Theta＝ø to 2＊TwoPi st ep Inc |
| 210 | LC＝int（14） numbers between 2 and 15 for line colors |
| 229 | color 1，1，LC |
| 236 | $\mathrm{X} 1=\mathrm{FNPol}$ ar X （R1，Theta） |
| 240 | Y1＝FNPol ar Y（R2，Theta） |
| 256 | X2＝FNPolar X （R3，Theta＋Pi） |
| 269 | Y2＝FNPol ar Y （R4，Thet $a+P i$ ） |
| 279 | linef $\mathrm{X} 2, \mathrm{Y} 2, \mathrm{X} 1, \mathrm{Y} 1$ |
| $28 \square$ | next |
| 29. | gosub PAUSE：gosub WIPE |
|  | ＇Module 2：SideOvals－－ |
| 316 | R1＝149 |
| 329 | $\mathrm{R} 2=28$ |
| 330 | $\mathrm{R} 3=65$ |
| 340 | R4＝65 |
| 359 | Inc＝Pi／64 |
| 360 | Offset＝Pi／3 |
| 379 | for Theta＝ø to 了＊TwoPi st ep Inc |
| 386 | $\begin{aligned} & \text { LC=int }(14 \text { 数nd })+2 \text { : col or } 1 \text {, } \\ & 1, \text { LC } \end{aligned}$ |
| 399 | X1＝FNPol ar X （R1，Theta） |
| $49 \square$ | Y1＝FNPol arY（R2，Theta） |
| 416 | X2＝FNPol ar $X$（R3，Theta＋Offs et） |
| 429 | Y2＝FNPol ar $Y$（R4，Theta） |
| 430 | linef $\mathrm{X} 1, \mathrm{Y} 1, \mathrm{X} 2, \mathrm{Y} 2$ |
| 449 | next |
| 459 | gosub PAUSE：gosub WIPE |
| 466 | ＇Module 3：TwistedBand－ |
| 47ø | R1＝14g |
| 489 | $\mathrm{R} 2=28$ |
| 490 | $R 3=65$ |
| $5 \square \square$ | $\mathrm{R} 4=65$ |
| 515 | Inc＝Pi／64 |
| 529 | Offset＝Pi／3 |
| 530 | for Theta＝ø to 3＊TwoPi st ep Inc |
| 54ø | $\begin{aligned} & \text { LC=int }(14 \text { z rnd })+2: \text { col or } 1, \\ & 1, L C \end{aligned}$ |
| $55 \square$ | X1＝FNPol ar X（R1，Theta） |
| $56 \square$ | Y1＝FNPol ar Y （R2，Theta） |
| 578 | X2＝FNPol ar X （R3，Theta） |
| $58 \emptyset$ | Y2＝FNPolarY（R4，Theta＋Dffs et） |
| 590 | linef $\mathrm{X}_{1}, \mathrm{Y}_{1}, \mathrm{X} 2, \mathrm{Y} 2$ |
| 690 | next |
| 610 | gosub PAUSE：gosub WIPE |
| 629 | ＇Module 4：MultiLobe－－ |
| 630 | R1＝95 |
| 649 | Inc＝Pi／128 |
| 659 | Lobes＝4 |
| 669 | for Theta＝ø to 2＊TwoPi st ep Inc |
| 670 | $\begin{aligned} & \text { LC=int }(14 \text { 戠rnd })+2 \text { : col or } 1 \text {, } \\ & 1, \text { LC } \end{aligned}$ |
| 689 | R2＝R1＊sin（Lobes＊Theta） |
| $69 \square$ | X1＝FNPol ar X（R2，Theta） |
| 769 | Y1＝FNPol ar ${ }^{\text {（R2，}}$ ，Theta） |
| 710 | ```linef XCenter,YCenter,X1, Y1``` |
| 729 | next |
| 730 | gosub PAUSE：gosub WIPE |
| 740 | Module 5：Spiral Cone－－ |
| 750 | $\mathrm{R} 1=95$ |
| 766 | R2＝68 |
| 779 | Inc＝Pi／160 |
| 780 | Lobes＝3 |
| 790 | for Theta＝ø to 2＊TwoPi st ep Inc |
| 8 8ø | $\begin{aligned} & \text { LC=int }(14 \text { \&rnd })+2: \text { color } 1, \\ & 1, \text { LC } \end{aligned}$ |


| $81 \varnothing$ | X1=FNPol ar X (R1, Theta*Lobe 5) | $\begin{aligned} & 143 \varnothing \\ & 144 \varnothing \end{aligned}$ | INITIALIZE: <br> 'run this program in the | $\begin{aligned} & 198 \emptyset \\ & 199 \varnothing \end{aligned}$ | PLAYBACK: <br> 'put old color values bac |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 829 | Y1 =FNPol arY (R2, Theta) |  | low-res mode |  |  |
| 836 | ```linef XCenter,YCenter,X1, Y1``` | 1450 | title\$="ST BASIC Graphics | $\begin{aligned} & 2 ø \emptyset \emptyset \\ & 2 \emptyset 1 \emptyset \end{aligned}$ | for Kolor $=$ g to 15 poke contrl,14:pok |
| 846 | next | 1460 | gosub TITLEBAR:gosub HIDE |  | 1+2, $¢$ : poke contr 1+6, 4: pok |
| $85 \square$ | gosub PAUSE:gosub WIPE |  | MOUSE |  | e intin, Kolor |
| 860 | "Module 6:SideSpiralCone- | $\begin{aligned} & 147 \emptyset \\ & 148 \emptyset \end{aligned}$ | openw 2:fullw 2:clearw 2 gosub WIPE | 2626 | poke intin+2, $01 d \%$ (Kol or, $\varnothing$ ) |
| 879 | $\mathrm{R} 1=121$ | 1490 | randomize(б):'keep the co | 2939 | poke intin+4, $018 \%$ (Kolor, 1 |
| 88ø | R2=64 |  | lor sequence random |  |  |
| 899 | Inc=Pi/160 | 15øø | 'define constants | 2640 | poke intin+6,01d\% (Kolor,2 |
| $9 \varnothing 0$ | 1 obes=3 | 1510 | $\mathrm{Pi}=3.14159$ |  |  |
| 910 | for Theta=ø to 2*TwoPi st ep Inc | 1520 1530 | TwoPi $=2 \mathrm{*Pi}$ | $265 \emptyset$ | vdisys (ø) |
| 920 | LC=int (14*rnd) +2 : color 1 , | 1540 | YCenter $=83$ | 2070 | return |
|  | 1, LC | 1550 | 'define polar to Cartesia | 2080 | HIDEMOUSE: |
| 936 | X1=FNPol ar X (R1, Theta) |  | $n$ conversion functions | 299ø | 'hide the mouse pointer |
| 946 | Y1=FNPolarY(R2, Theta*lobe 5) | 156ø | DEF FNPolarX(R,Theta) $=\mathrm{r}$ \# C os (Theta) + XCenter | $21 ø 0$ | poke contrl,123:poke cont 1+2, $\varnothing$ |
| 950 | ```linef XCenter,YCenter, X1, Y1``` | 1570 | DEF FNPol arY (R, Theta) $=r$ *s in(Theta) +YCenter | 2110 | poke contrl+6, $0:$ vdisys(ø) |
| 960 | next | 1589 | return | 2120 | return |
| 976 | gosub PAUSE:gosub WIPE | 1590 | PAUSE: | 2130 | SHOWMOUSE: |
| 980 | 'Module 7:Circles-- | 1690 | for delay=1 to 5øøø: next | 2140 | 'bring the mouse pointer |
| 990 | $\mathrm{R} 1=197$ | 1610 | return |  | back |
| $1 \varnothing \varnothing \square$ | $\mathrm{R} 2=68$ | 1629 | TITLEBAR: | 2150 | poke contrl,122:poke cont |
| 1010 | $\mathrm{R} 3=49$ | 1630 | a*=gb: gintin=peek (a\#+8) |  | $r 1+2, \varnothing$, |
| 1020 | $\mathrm{R} 4=34$ | 1640 | poke gintin+g, peek (systab | 2160 | poke contrl $+6,1:$ poke inti |
| 1030 | Inc $1=P \mathrm{Pi} / 3$ |  | +8): poke gintin $+2,2$ |  | n, $¢:$ vdisys (ø) |
| 1040 | Inc2=Pi/2Ø | 1650 | s\#=gintin+4:title\$=title\$ | 2179 | return |
| 1050 | for Theta=ø to TwoPi step Inc 1 | 1660 | +chr ${ }^{\text {( }}$ ( $)$ | 2189 2190 | COPYRIGHT: |
| $1 \varnothing 6 \square$ | $\begin{aligned} & \text { LC=int }(14 * r n d)+2 \text { : col or } 1 \text {, } \\ & 1, \text { LC } \end{aligned}$ | 1670 | msys (195) return | 22øø | gotoxy 12,3 :print"Math G raphics" |
| 1070 | for Theta2=ø to TwoPi ste p Inc2 | $\begin{aligned} & 1680 \\ & 1690 \end{aligned}$ | MEDIUMRES: <br> 'prompt user to switch to | 2220 | gotoxy 2,7:print"Copyrigh t 1987 COMPUTE! Pub., Inc |
| 1080 | LC=int (14*rnd) +2 : color 1 , |  | low-res |  |  |
| $1 \varnothing 9 \varnothing$ | 1, LC $\mathrm{X} 1=\mathrm{FNPol}$ ar X (R1, Theta2) | 17øø | A\#=GB: gintin=peek (A\#+B):g | 2230 | gotoxy 8,9:Print "All Rig |
| 1100 | Y1 =FNPol arY (R2, Theta2) |  | =peek (A\#+16) | 2240 | for t=1 to 2øøø: next |
| 1116 | X2=FNPol ar $X$ (R3, Theta) | 171ø | Text\$="[3][:MathGraphics | 225ø | return |
| 1120 | $Y 2=F N P o l a r Y(R 4$, Theta) |  | for ST is designed: to |  |  |
| 1130 | linef $\mathrm{X}_{1}, \mathrm{Y}_{1}, \mathrm{X} 2, \mathrm{Y} 2$ |  | run in Low Resolution][ 0 |  | am 2: MGRAF2.BAS |
| 1140 | next |  | .K. J" |  | min 2. |
| 1150 | next | $1720$ | gosub ALERT:end |  |  |
| 1160 | gosub PAUSE:gosub WIPE | $1730$ | ALERT: | 10 | 'Copyright 1987 |
| 1179 1186 | 'Module 8: Spikes-- | 1740 | 'put message into alertbo |  | Publications Inc. |
| 1186 1190 | $R 1=1 ø 7$ $R 2=68$ |  | $x$ and display on screen | 26 | 'All Rights Reserved |
| 1190 | $\mathrm{R} 2=68$ | $175 \varnothing$ | gosub SHOWMOUSE | 60 | dim 01d\% (16,3): 'array for |
| 1200 | $\mathrm{R} 3=4 \varnothing$ | 1769 | N\#=addrin:poke gintin, $\varnothing$ |  | color values |
| 1210 | R4=34 | 1770 | Text\$=Text\$+chr\$( $)+\mathrm{chr}$ \$ ( | 70 | if peek (systab) $=4$ then go |
| 1220 | Inc1=Pi/3 |  |  |  | to MathGraphics |
| 1230 | Inc2=Pi/18 | 1789 | poke N\#, varptr (Text\$) | $8 \square$ | goto MEDIUMRES |
| 1240 | for Theta=ø to TwoPi step Inc 1 | 179ø | gemsys (52) | 90 100 | MathGraphics: gosub COPYRIGH |
| 125ø | LC=int ( 14 * rnd) +2: color 1, | 1860 1810 | Key=peek return | 110 | gosub RECORD |
|  | 1, LC | 1820 | WIPE: | 120 | gosub INITIALIZE |
| 1260 | for Theta2=ø to TwoPi ste p Inc2 | 1830 | 'quickly paint the screen black | $\begin{aligned} & 13 \emptyset \\ & 14 \emptyset \end{aligned}$ | 'Module 1:RightOvals- $R 1=14 \varnothing$ |
| 1270 | LC=int (14*) rnd$)+2$ : col or 1 , | 1849 | color 1, 1:poke contri, 114 | $15 \varnothing$ | $\begin{aligned} & R 2=2 \emptyset \\ & R 3=25 \end{aligned}$ |
| 128ø | X 1 =FNPol ar X (R1, Theta2) |  | :poke contrl+2, 2 : poke con trl $+6, \varnothing$ | 170 | $R 3=25$ $R 4=65$ |
| 1290 | Y1 =FNPol $\operatorname{ar} Y$ (R2, theta) | 1850 | poke ptsin, 1:poke ptsin+2 | $18 \emptyset$ | Incmepi/64 |
| 13øø | X2=FNPol $\operatorname{ar} \mathrm{X}$ (R3, Theta) |  | ,22:poke ptsin+4,3ø4 | 196 | Kol or=2 |
| 1310 | Y2=FNPolar $Y$ (R4, Theta2) | 1860 | poke ptsin+6,188:vdisys (ø) | 296 | for Thetamg to 2*TwoPi st |
| 1320 | linef $\mathrm{X} 1, \mathrm{Y} 1, \mathrm{X} 2, \mathrm{Y} 2$ |  |  |  | ep Inc |
| 1330 | next | 187ø | return | 210 | color 1, 1, Kol or |
| 1340 | next | 1889 | RECORD: | 220 | X1=FNPol ar ${ }^{\text {( }}$ (R1, Theta) |
| $135 \emptyset$ | gosub PAUSE:gosub WIPE | 1890 | 'peek old color values an | 236 | Y1 =FNPol $\mathrm{ar}^{\text {Y }}$ (R2, Theta) |
| 1360 | FINISHED: |  | $d$ store in array | 240 | X2=FNPol ar X (R3, Theta+Pi) |
| 1370 | 'clean up and end the pro | 1960 | for Kolor=ø to 15 | 256 |  |
|  | gram | 1910 | poke contrl, 26:poke contr | 260 | linef $\mathrm{X} 2, \mathrm{Y} 2, \mathrm{X} 1, \mathrm{Y} 1$ |
| 1380 | A\#=GB: gintin=peek ( $A$ \# $+B$ ): g intout=peek (AW+12): addrin =peek (A\#+16) | 1920 | $1+2, \varnothing$ : poke contrl+6,2 poke intin, Kolor:poke int in +2 , Ø: vdisys (ø) | 270 | ```Kolor=Kolor+1:if Kolor>15 then Kolor=2 next``` |
| 1390 | Text\$="[g][:MathGraphics for ST : J | 1930 | Old\% (Kol or, $\varnothing$ ) =peek (intout +2) | 290 300 | gosub PAUSE <br> gosub ANIMATE:gomub WIPE |
| 14øø | Text\$=Text\$+"[ Re-run : Q | 1940 | Old\% (Kolor, 1) =peek (intout | 316 | 'Module 2:SideOvals-- |
|  | uit ]":gosub ALERT |  | +4) | 320 | R1=14ø |
| 1410 | if Key=2 then gosub PLAYB | 1950 | $01 \mathrm{~d} \%$ (Kol or, 2) $=$ peek (intout | 330 | $\mathrm{R} 2=28$ |
|  | ACK:clearw 2:closew 2:end |  | +6) | 346 | R3 $=65$ |
|  |  | 1960 | next Kolor | 350 | R4=65 |
| 1420 | goto MathGraphics | 1970 | return | 360 | Inc=Pi/64 |


| 37ø | Offset＝Pi／3 Kol or＝2 |  | ep Inc color 1，1，Kolor | 1790 | gosub TITLEBAR：gosub HIDE |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 389 |  | 1069 |  |  | MOUSE |
| 39.1 | for Theta＝g to 3＊TwoPi st | 1070 | $X_{1}=$ FNPol ar $X$（R1，Theta） | 1710 | openw 2：fullw 2：clearw 2 |
|  | ep Inc | 1689 |  | 1726 | gosub WIPE |
| 406 | color 1，1，Kolor |  | 5） | 1736 | ＇define constants |
| 410 | $\mathrm{X} 1=$ FNPol ar X （R1，Theta） | 159. | linef XCenter，YCenter， $\mathrm{X}^{\text {1，}}$ | 1740 | $\mathrm{Pi}=3.14159$ |
| 420 | Y1＝FNPol $\operatorname{ar} Y$（R2，Theta） |  | Y1 | 1750 | TwoPi $=2$ \％Pi |
| 430 | X2＝FNPol ar $X$（R3，Theta＋Offs | 11.0 | Kolor＝Kol or＋1：if Kolor＞15 | 1769 | XCenter $=151$ |
|  | et） |  | en Kol | 1776 | YCenter $=83$ |
| 440 | Y2＝FNPolar $\mathrm{V}^{\text {（R4，}}$ ，Theta） | 1119 | next | 1789 | ＇define polar to Cartesia |
| 459 | linef $\mathrm{X} 1, \mathrm{Y} 1, \mathrm{X} 2, \mathrm{Y} 2$ | 1129 | gosub PaUsE |  | $n$ conversion functions |
| 460 | ```Kolor=Kolor+1:if Kolor>15 then Kolor=2``` | $\begin{aligned} & 1139 \\ & 114 \varnothing \end{aligned}$ | gosub ANIMATE：gosub WIPE <br> ＇Module 7：Circles－－ | 179ø | $\text { DEF FNPolar } X(R, \text { Theta })=r * c$ os (Theta) + XCenter |
| 479 | next | 1150 | $\mathrm{R} 1=107$ | 18øø |  |
| 48ø | gosub PAUSE | 11 | R2 $=68$ |  | in（Theta）+ YCenter |
| 490 | gosub ANIMATE：gosub WIPE | 1170 | R3 $=49$ | 1810 | return |
| 5øø | ＇Module 3：TwistedBand－－ | ¢ | R4＝34 | 1829 | PAUSE： |
| 510 | R1＝140 | 1198 | Inc1＝Pi／3 | 1836 | for delay＝1 to 5øøø：next |
| 529 | $\mathrm{R} 2=28$ | 1208 | Kolor＝2 | 1848 | return |
| 539 | $\mathrm{R} 3=65$ | 1210 | Kol rl （her | 1859 | TITLEBAR： |
| 540 | R4＝65 | 1226 | for Theta＝ø to TwoPi s Inc 1 | 1869 | a\＃＝gb：gintin＝peek（a\＃＋8） |
| 559 | Inc＝Pi／64 | 1239 | color 1，1，Kolor | 1870 | poke gintin＋ø，peek（systab |
| 560 | Offset＝Pi／3 | $1240$ | for Theta2＝ø to TwoPi ste |  | ＋8）：poke gintin＋2，2 |
| 570 | Kolor＝2 | 1240 | p Inc2 | 1880 | s\＃＝gintin＋4：title\＄＝title\＄ |
| 580 | for Theta＝g to 3＊TwoPi s ep Inc | 1259 | color 1，1，Kol or | 1890 | Chr $\$$（ø） <br> ke s\＃，varptr（title\＄）：ge |
| 590 | color 1，1，Kolor | 1268 | X1＝FNPol ar ${ }^{\text {（ }}$（R1，Theta2） |  | msys（105） |
| $6 \boxed{6}$ | X1＝FNPol ar X（R1，Theta） | 1279 | Y1＝FNPol arY（R2，Theta2） | 19øø | return |
| 610 | Y1＝FNPol $\operatorname{ar} Y$（R2，Theta） | 1280 | X2＝FNPolarX（R3，Theta） | 1910 | MEDIUMRES： |
| 620 | X2＝FNPolar X （R3，Theta） | 1290 | $Y 2=F N P O 1 a r Y$（R4，Theta） | 1928 | ＇prompt user to switch to |
| 630 | Y2＝FNPol arY（R4，Theta＋Dffs et） | $\begin{aligned} & 139 \varnothing \\ & 1310 \end{aligned}$ | Kol or＝Kol or＋1：if Kolor＞15 | 1930 |  |
| 640 | linef $\mathrm{X} 1, \mathrm{Y} 1, \mathrm{X} 2, \mathrm{Y} 2$ |  |  |  | intout＝peek（A\＃＋12）：addrin |
| 650 | ```Kolor=Kolor+1:if Kolor>15 then Kolor=2``` | $\begin{aligned} & 1320 \\ & 1330 \end{aligned}$ | Kolor＝Kolor＋1：if Kolor＞15 | 194ø | ```=peek (A#+16) Text$="[3][:MathGraphics``` |
| 660 | next |  | then Kolor＝2 | 194 | for ST is designed：to |
| 679 | gosub PAUSE | 1340 | nex |  | run in Low Resolution］［ 0 |
| 686 | gosub ANIMATE：gosub WIPE | 1350 1368 | gosub PaUSE <br> gosub ANIMATE：gosub |  | －K．J＂ |
| 698 | ＂Module 4：MultiLobe－－ | 1379 | ＇Module 8：Spikes－－ |  | gosub ALERT：end |
| 790 | $\mathrm{R} 1=95$ | 1380 | R1＝1ø7 |  | ALERT： |
| 719 | Inc＝Pi／128 | 1390 | $\mathrm{R} 2=68$ | 1976 | x and display on screen |
| 720 | 1 obes＝4 | 14øの | $R 3=40$ | 1989 | gosub SHOWMOUSE |
| 736 | Kol or＝2 | 1410 | $\mathrm{R} 4=34$ | 1990 | N\＃\＃addrin：poke gintin，$\varnothing$ |
| 740 | for Theta＝ø to 2＊TwoPi st | 1429 | Inc $1=\mathrm{Pi} / 3$ | 2øøø | Text $=$ Text $\%+c h r \$(\varnothing)+$ chr $\$$（ |
|  | ep Inc | 1430 | Inc2＝Pi／18 |  |  |
| 756 | color 1，1，Kolor | 1446 | Kol or＝2 | 2010 | poke N⿻丷木⿴囗⿱一一 ，varptr（Text\＄） |
| 760 | R2＝R1＊sin（lobes＊Theta） | 1459 | for Theta＝g to TwoPi step | 2026 | gemsys（52） |
| 770 | X1＝FNPol ar $X$（R2，Theta） |  | Inc1 | 2636 | Key＝peek（gintout） |
| 780 | Y1＝FNPol ar Y（R2，Theta） | 1460 | color 1，1，Kol or | 2040 | return |
| 790 | linef XCenter，YCenter，X1， Y1 | 147ø | for Theta2＝ø to TwoPi ste | 2050 | WIPE： |
| 80¢ | ```Kolor=Kolor+1:if Kolor>15 then Kolor=2``` | $\begin{aligned} & 148 \emptyset \\ & 149 \emptyset \end{aligned}$ | color 1，1，Kol or | 2060 | ＇quickly paint the screen black |
| 819 | next | 1590 | Y1＝FNPolar ${ }^{\text {a }}$（R2，theta） | 267ø | color 1，1：poke contri， 114 |
| 820 | gosub PAUSE | 1516 | X2＝FNPol ar X （R3，Theta） |  | ntrl＋2，2：poke co |
| 830 | gosub ANIMATE：gosub WIPE | 1520 | Y2＝FNPol arY（R4，Theta2） | 2080 |  |
| 84Ø | ＇Module 5：Spiral Cone－－ | 1536 | linef $\mathrm{X} 1, \mathrm{Y} 1, \mathrm{X} 2, \mathrm{Y} 2$ | 2000 | ，22：poke ptsin＋4，3छ4 |
| 850 | R1 $=95$ | 1540 | Kolor＝Kolor＋1：if Kolor＞15 | 2690 | poke ptsin＋6，188：vdisys（g |
| 860 | $\mathrm{R} 2=68$ |  | then Kolor＝2 |  | ; |
| 878 | Inc＝Pi／160 | 1550 | next | 2190 | return |
| 889 | Lobes＝3 | 1560 | Kolor＝Kolor＋1：if Kolor＞15 | 2110 | RECORD： |
| $89 \square$ | Kol or $=2$ |  | then Kolor＝2 | 2129 | ？peek old color values an |
|  |  ep Inc | $157 \emptyset$ $158 \emptyset$ | next |  | d store in array |
| 916 | color 1，1，Kolor | 1590 | gosub ANIMATE：gosub | 2130 | for Kolor＝ø to 15 |
| 920 | X1＝FNPol ar X（R1，Theta＊Lobe | 1690 | FINISHED： |  | ＋2，6：poke contrl＋6，2 |
| 936 | 5）${ }^{\text {S }}$＝FNPol $\operatorname{ar} Y$（R2，Theta） | 1619 | ＇clean up and end the pro | 2150 | poke intin，Kolorspoke int |
| 946 | ```linef XCenter,YCenter,X1, Y1``` | 1626 | A朔＝GB：gintin＝peek（A\＃＋B）：g intout＝peek（A聿＋12）：addrin | 2160 | in＋2，ø：vdisys（ø） <br> O1d\％（Kol or，©）mpeek（intout |
| 956 | ```Kol or=Kol or+1:if Kolor>15 then Kolor=2``` | 1630 | int ＝peek（AW＋16） Text $\$=$＂$¢ 0][$ MathGraphics | 2170 | $+21$ <br> O1d\％（Kol or，1）＝peek（intout |
| 960 | next |  | for ST ：］＂ |  |  |
| 979 | gosub PAUSE | 1649 | Text\＄＝Text\＄＋＂［ Re－run ：Q |  | $+6)$ |
| 989 | gosub ANIMATE：gosub WIPE |  | uit J＂：Gosub ALERT | 2190 | next Kolor |
| 990 | ＂Module 6：SideSpiral Cone－ | 1650 | if Key＝2 then gosub PLAYB | 2269 | return |
|  | － |  | ACK：clearw 2：closew 2：end | 2210 | PLAYBACK： |
| $196 \square$ | R1＝121 |  |  | 2229 | ＇put old color values bac |
| 1010 | $\mathrm{R} 2=64$ | 1660 1670 | goto MathGraphics <br> INITIALIZE： | 2220 | $k^{\prime}$ |
| 1020 | Inc＝Pi／160 | 1679 | INITIALIZE： |  | for Kolor＝ø to 15 |
| 1030 | Lobes＝3 | 1689 | run this program in the low－res mode | $\begin{aligned} & 2250 \\ & 224 \varnothing \end{aligned}$ | poke contrl，14：poke contr |
| 1940 | Kol or $=2$ |  | title\＄＝＂ST BASIC Graphics |  | 1＋2，Ø：poke contr1＋6，4：pok |
| 1659 | for Theta＝ø to 2\％TwoPi st | 1695 | titles＝＂ST BASIC Graphics |  | e intin，Kolor |


| 225ø | poke intin+2,01d\%(Kolor, $\varnothing$ , |
| :---: | :---: |
| 2260 | poke intin+4, $01 d \%$ (Kolor, 1 ) |
| 227ø | poke intin+6, Old\% (Kol or, 2 ) |
| 228ø | vdisys (0) |
| 2290 | next Kolor |
| 23Øø | return |
| 2310 | BLUES: |
| 2320 | "turn lines on and off in cyan |
| 2330 | poke contrl,14:poke contr $1+2$, : poke contrl $1+6,4$ : pok e intin, Kolor |
| 2340 | poke intin+2, $01 \mathrm{~d} \mathrm{\%}(1 \varnothing, \emptyset)$ |
| 2350 | poke intin+4, $01 \mathrm{~d} \mathrm{\%}(15,1)$ |
| 2366 | poke intin+6, $01 d \%(10,2)$ |
| 2370 | vdisys (ø) |
| 2389 | return |
| 2396 | BLACKOUT: |
| 24øø | 'turn all colors black |
| 2419 | poke contrl,14:poke contr 1+2, Ø: poke contrl+6,4:pok e intin, Kolor |
| 2420 | poke intin+2, $01 \mathrm{~d} \mathrm{\%}(1, \varnothing)$ |
| 243ø | poke intin+4, $01 \mathrm{~d} \mathrm{\%}(1,1)$ |
| 2440 | poke intin+6, $01 d \%(1,2)$ |
| 245ø | vdisys(ø) |
| 2460 | return |
| $247 \emptyset$ | ANIMATE: |
| 2480 | 'perform simulated animat ion |
| 2496 | for Kolor=2 to 15: gosub B LACKOUT: next |
| 25øø | Kol or=15: Cycle=3øø |
| $251 \%$ | while Cycle |
| 2520 | gosub BLACKOUT:if Kolor=1 5 then Kolor=1 |
| 2530 | Kol or $=$ Kol or +1 : gosub BLUES : Cycle=Cycle-1 |
| 2540 | wend |
| 2550 | gosub PLAYBACK |
| 2560 | return |
| 2570 | HIDEMOUSE: |
| 2589 | 'hide the mouse pointer |
| 2590 | poke contrl,123:poke cont r1+2, $\varnothing$ |
| 260\% | poke contri+6, $0:$ vdisys (\%) |
| 2610 | return |
| 2626 | SHOWMOUSE: |
| 2636 | 'bring the mouse pointer back |
| 2645 | poke contr1,122:poke cont r1+2, $\varnothing$ |
| 2650 | poke contrl +6 , 1: poke inti n, Ø: vdisys(Ø) |
| 2660 | return |
| 2679 | COPYRIGHT: |
| 2689 | fullw 2 : clearw 2 |
| 2690 | gotoxy 12,3 :print"Math G raphics" |
| 2710 | gotoxy 2,7:print"Copyrigh t 1987 COMPUTE! Pub., Ine |
| 2720 | gotoxy 8,9:Print "All Rig hts Reserved" |
| 2730 | for t= 1 to 2øøø:next |
| 274ø | clearw 2 |
| 2750 | return |

# 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 onscreen 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．
6920 REM ALL RIGHTS RESERVED．
5525 HOME
5130 PRINT＂COPYRIGHT 1987＂：PR INT＂COMPUTE！PUBLICATIONS ，INC．＂：PRINT＂ALL RIGHTS RESERVED．＂
E5 $6 \boxed{6}$ FOR $I=768$ TO 95ø：READ $J$ ：POKE I，J：NEXT
$247 \emptyset$ DATA $169,9,141,189,3,165,7$ ，72，166， $9,177,6,265,189,3$ ， $268,15,238,189,3,268,4,194$ ，198，6，96，194，72，133，7，268 ，232，2øø，2ø8，231，104，72， 24 ，195，32，236，7，197，7，298， 22 Ф，164，133，7，24，165，32，72， 1 $77,6,141,181,3,173,18 \emptyset$
DD $8 \emptyset$ DATA $3,145,8,2 \emptyset 6,132,26,16$ 2，1，177，6，265，181，3，246，4， 32，89，3，292，232，298，77， 262 ，32，89，3，262，246，246，141， 1 82，3，132，25，164，26，224，4，1 $44,41,173,189,3,145,8,299$ ， 298，2，239，9，138，145，8，299， $268,2,236,9,173,181,3$
IB 96 DATA $145,8,2 \emptyset \varnothing, 208,2,23 \emptyset, 9$ ，132，26，164，25，173，182，3， 1 $41,181,3,162,1,96,141,182$ ， $3,173,181,3,145,8,269,298$ ， 2，23ø，9，262，268，246，24ø， 22 $5,260,268,162,239,7,164,72$ ，197，7，268，154，164，32，89， 3 $, 164,26,136,132,8,96,5,6,6$
441 1øD HOME
FC 11ø HTAB 11：INVERSE ：PRINT ＂PICTURE．COMPRESSOR＂：NOR MAL
$2112 \varnothing$ PRINT ：PRINT＂THIS PROGR AM CAN COMPRESS MOST HI－R ES PICTURES TO CONSERVE SPACE ON YOUR DISK．THE A MOUNT DF SPACE SAVED DEPE NDS ON THECOMPLEXITY OF T HE PICTURE．＂
ff $13 \emptyset$ PRINT ：PRINT＂SOMETIMES， EXTREME COMPLEXITY OF TH E ORIEINAL 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．＂
10135 PRINT ：PRINT＂PRESS＜RET URN＞＂；：INPUT＂＂；RT\＄
6A 138 HOME
B 148 PRINT ：PRINT＂DECOMPRESS ING THE＇PACKED＇PICTURES IS DONE BY USING THE＇D ECOMPRESS＇COMMAND PROGR AM．＂
FC 145 PRINT
$4 E 146$ PRINT＂TO USE＊DECOMPRESS ，FIRST BRUN IT TO INSTA LL IT．THEN，YOU TYPE：
＇DECOMPRESS FILE NAME（，S）（，D）（，A（HHHH）OR（ ，ADDDD）＂＂：PRINT＂SLDT，DR IVE，AND ADDRESS PARAMETE RS ARE OPTIONAL．（ADDRES 3 CAN BE USED TO LOAD＂
38147 PRINT＂THE PICTURE ON ANO THER PAGE．＂
68150 PRINT ：PRINT
$7916 \varnothing$ PRINT＂WHAT SLOT IS YOUR DISK IN＂；：INPUT SL

67170 PRINT＂WHAT DRIVE＂；：INPU T DV
FB $18 \emptyset$ PRINT CHR（4）＂PREFIX，S＂S L＂，D＂DV
83182 PRINT ：PRINT＂IS YOUR PI CTURE IN A SUBDIRECTORY＂； ：INPUT YNB：IF LEFT（Y（YN \＄，1）＝＂Y＂THEN GOSUB 7 7 Ø
33185 PRINT＂FILENAME OF PICTUR E？＂；：INPUT＂＂；NP象
7186 IF LEN（NP\＄）＜ 15 THEN NP （ $=\mathrm{NP} \$+{ }^{(1)}$＂：GOTO 186
69 $19 \varnothing$ PRINT CHR\＄（4）＂PREFIX＂：I NPUT PX象
65200 PRINT CHR\＄（4）＂OPEN＂PX\＄ ＂，TDIR＂
DE $21 \emptyset$ PRINT CHR\＄（4）＂READ＂PX\＄
2F 226 INPUT A\＄：IF MID\＄（A\＄，2， 1
5）$=$ NP
14 23ø GOTO 220
7A 25ø PRINT CHR\＄（4）＂CLOSE＂
D4 26 LA $\$=$ RIGHT $\$(A \$, 4)$
$6127 \emptyset$ FT $\$=\operatorname{MID} \$(A \$, 18,3)$
2E 28 BK $\$=\operatorname{MID} \$(A \$, 27,2)$
C6 $29 \varnothing$ IF FT\＄＜＞＂BIN＂THEN 5øø
55 3øø IF LA\＄＜＞＂4øøø＂AND LA\＄ ＜＞＂2øøø＂AND LA\＄＜＞＂
1FFF＂AND LA\＄＜＞＂3FFF＂
THEN 5øø
$7531 \emptyset$ POKE 6， $0: ~ P O K E ~ 8, ~ ந ~$
6832 IF LA\＄＝＂2øøø＂OR LA\＄$=$ ＂1FFF＂THEN POKE 7，64：PO KE 9，32：S＝8192：OA＝$=163$
84：IF LA $=$＂1FFF＂THEN
$O A=O A-1$
$4533 \emptyset$ IF LA\＄$=$＂4のøの＂OR LA\＄$=$ ＂3FFF＂THEN POKE 7，32：PO KE 9，64：S＝16384：OA＝81 92：IF LA $=$＂3FFF＂THEN $O A=O A-1$
33 349 PRINT CHR（4）＂BLOAD＂NP象 ＂，A＂DA
EC 35g CALL 768
65355 IF PEEK（ 6 ）＜＞ $\boldsymbol{0}$ THEN $6 ฐ$
5 SA PEEK（8）+256 （ PEE $K$（9）
$5 A 36 \%$ IF $S A>s+8192-512 \mathrm{TH}$ EN 6日月
88465 PRINT CHR（4）＂DELETE＂NP \＄
4） 479 PRINT CHR（4）＂BSAVE＂NP象
＂，A＂ $\mathbf{B}^{\prime \prime}, E^{\prime \prime} S A$
18475 IF $S A-5<513$ THEN CB $=$ 1：GOTO 485
$2948 \emptyset C B=2+$ INT $((S A-5) /$ 512）
69485 PRINT ：PRINT ：PRINT＂YO UR PICTURE HAS BEEN COMPR ESS FROM＂BK\＄＂BLOCKS TO ＂CB＂BLOCKB．＂
67487 PRINT ：PRINT＂TO DECOMPR ESS THE PICTURE AGAIN，JU GT＇BRUN DECOMPRESS＇AN D USE THE DECDMPRESSCOMMA ND TO UNPACK THE PICTURE．

9E $49 \varnothing$ END
B4 5月ø HOME ：PRINT＂THIS FILE I 5 NOT A HI－RES PICTURE．＂； CHR（7）：END
C7 6øØ HOME ：PRINT＂THIS PICTUR E IS TOO COMPLEX TO GAIN ANY DISK SPACE BY COMPRES SING．＂；CHR象（7）：END
98 7øø PRINT ：PRINT＂WHAT IS TH E NAME OF THE SUBDIRECTOR $Y^{\prime \prime} ;$ I INPUT SB
AS 71ø PRINT CHR\＄（4）＂PREFIX＂SB象
IB 726 RETURN

## Program 2：Decompress

Please refer to the＂MLX＂article in this issue before entering the following program．
 26ø8：$A 9$ ตE 4C 99 BE AE 67 BE 3日
 2ø18： 21 Ag øø BC 97 BE AA BE Fø 2626： 3526 B9 $6 \emptyset 21$ C9 21 D6 7D 2ø28：ஏ3 BA Dg $97 C 922$ Dg 6392 263ஜ：EB BA CA 99 ตg 98 CB D月 3F 2638：E9 EE 24 20 AD 2420 C9 B7 264ஜ： 23 Fø ø5 EE 3526 Dø DA 84 2648：BE 日8 BE B9 57 20 Fø 6668 2959：20 ED FD CB Dg F5 6® A7 2F 2658：C4 C5 C3 CF CD Dø D2 CS FE 296छ：D3 DJ A7 Ag CJ CF CD CD 45 2068：C1 CE C4 Ag C9 CE D3 D4 ES 2979：C1 CC CC C5 C4 AE BD BD 44 2678：D7 D2 C9 D4 D4 C5 CE Ag DB 2989：C2 D9 Ag CA C1 DJ CF CE 25 2688：Ag CJ CF CC CS CD C1 CE BB 2995：BD CA D5 CE CS AC A历 B1 C5 2698：B9 BE B6 8D 8D 95 © 96 FF





 2曰D®：





 21g8：CB C9 Ag Fg FB 29 DF DD 4E 21168 3D 21 Dø 25 EB Eff gA DA 55 2118：EC CA BE 52 BE A2 1 日月 81 2127： 99 BE 53 BE EB BE 54 BE C9 2128：A2 84 BE 55 BE A9 47 日D BC $2130: 50 \mathrm{BE}$ A9 21 日D 51 BE 18 DB 2138：60 38 4C 9E BE C4 C5 C3 84 2149：CF CD Dg D2 CS D3 D3 A9 F3 2148：GA BD B4 BE AD 6C BE BD 9F 2159：B5 BE AD 6D BE BD B6 BE $\mathrm{EL}^{2}$ 2158：A9 C4 2ø 76 BE Bø 48 AD A2

 217＠：B9 BE 日D 5B BE AD BA BE 57 2178：BD 59 BE AS 74 BD CF BE 42 2186：AD 58 BE 8566 AD 59 BE 38 2188： 85 g7 A9 99 日D CE BE AD 57 219ほ：6C BE BD CC BE AD 6D BE 7D 2198：BD CD BE A9 ø3 BD CB BE 2C
 21AE：AD Dg BE BD D6 BE A9 64 AF 21B9：日D D5 BE A2 $9 \mathscr{D}$ BE D7 BE D9 21B8：8E D9 BE E8 BE DA BE EB 65 21CE：BE DG BE 29 D1 21 BS 6F $3 E$ 21C8：B9 gø g2 8D 4822 CB Dg 2E


 21EB：D 62 E6 9784 g9 A4 ø日 FA 21F月：CB CC DB BE D9 E3 20 D1 5A 21F8： 21 9б DE Bg उA CB CC DB 41 2269：BE Dg 6520 D1 21 Bø 2F 1E


 222\％：CB D 92 E6 97 CA Dg F6 A7 2228： 84 99 A4 日B CB CC DB BE F5 223छ：D9 A7 26 D1 21 96 A2 A9 22 2238： 51 BD DD BE AD D6 BE 日D DB 224ஏ：DE BE A9 CC 26 7g BE G® 46

# Fractal Mountains For Amiga 

Matthew Timmerman

With this landscape-generating program and a 512 K 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 threedimensional. 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 $l v$. 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. 4
'All Rights Reserved. 4
CLEAR 327674
DEFSNG $\mathrm{a}-\mathrm{z} 4$
DIM Lv $(64,64) 4$
DIM cmap\$(31) 4
PRINT" Copyright 1987" 4
PRINT"Computel Publications, Inc
."4
PRINT" All Rights Reserved.":PR INT 4
RANDOMIZE 4
PRINT "Enter maximum variation (
Ø-2) (1 is nice) ";:INPUT max 4
PRINT "Enter a filename to save
picture under."\&
INPUT "(Saving at end is optiona 1.) "; fiL\$

FOR $\mathrm{a}=1$ TO 104
PRINT RND 4
NEXT 4
SCREEN $2,320,200,5,14$
WINDOW 3,"Mountain", $(\varnothing, \varnothing)$ - (311
,186),28,24
FOR $a=\emptyset$ TO 154
PALETTE $a, a / 15, a / 25, a / 504$
PALETTE $a+16, a / 15, a / 15, a / 154$
$\mathrm{a} \$=\operatorname{CHR}(\mathrm{a}=17) 4$
$\operatorname{cmap} \$(a)=a \$+\operatorname{CHR} \$(a \star 10.2)+\operatorname{CHR} \$($
a*5.1) 4
$\operatorname{cmap} \$(a+16)=a \$+a \$+a \$ 4$
NEXT 4
PALETTE $16,0, .25, .54$
$\operatorname{cmap} \$(16)=\operatorname{CHR}(\varnothing)+\operatorname{CHR} \$(64)+\operatorname{CHR}$

## \$(128)

COLOR 154
maxLv $=04$
MakeMount: 4
FOR iter $=6$ TO 1 STEP -14
sk $=2$ ^iter 4
$\mathrm{hL}=\mathrm{sk} / 24$
PRINT "Doing Iteration"; iter 4
Dotops: 4
PRINT "Tops \& Bottoms ";
FOR $y=\emptyset$ TO 64 STEP sk 4
FOR $\mathrm{x}=\mathrm{hL}$ TO 64 STEP sk 4
ran $=(\text { RND- } 5)^{*}$ max* ${ }^{\text {sk }} 4$
oLd $=(\operatorname{Lv}(x-h L, y)+\operatorname{Lv}(x+h L, y)) /$ 24
$\operatorname{Lv}(x, y)=o L d+\operatorname{ran} 4$
NEXT x 4
NEXT Y 4
Dobottoms: 4
PRINT "Sides ";4
FOR $x=\emptyset$ TO 64 STEP sk $\leftarrow$
FOR $y=h L$ TO 64 STEP sk $\nless$
$\operatorname{ran}=($ RND -.5$){ }^{*}$ max* ${ }^{*} \mathrm{sk}^{4}$
$\mathrm{oLd}=(\operatorname{Lv}(\mathrm{x}, \mathrm{y}-\mathrm{hL})+\operatorname{Lv}(\mathrm{x}, \mathrm{y}+\mathrm{hL})) /$
$\operatorname{Lv}^{24}(x, y)=o L d+\operatorname{ran} \psi$
NEXT $\mathrm{y}^{4}$
NEXT $\times 4$
Docentres: 4
PRINT "Centers "
FOR $\mathrm{x}=\mathrm{hL}$ TO 64 STEP $\mathrm{sk} \angle$
FOR $y=h L$ TO 64 STEP $s k ~ 4$
$\operatorname{ran}=($ RND -.5$){ }^{*}$ max $^{*}$ sk ${ }^{4}$
oLdl $=(\operatorname{Lv}(x+h L, y-h L)+L v(x-h L$,
$\mathrm{y}+\mathrm{hL}$ )) / 24
oLd2 $=(\operatorname{Lv}(x-h L, y-h L)+L v(x+h L$,
$\mathrm{Y}+\mathrm{hL})$ ) / 24
oLd $=($ oLd $1+$ oLd 2$) / 24$
$\operatorname{Lv}(x, y)=o L d+\operatorname{ran} 4$
$\operatorname{IF} \operatorname{Lv}(x, y)>$ maxLv THEN maxLv $=$
$\operatorname{Lv}(x, y) 4$
NEXT $\mathrm{y}^{4}$
NEXT $\mathrm{x}^{4}$
NEXT iter 4
snowLine $=\operatorname{maxLv}-\operatorname{maxLv} / 44$
drawmount: 4
CLS 4
$\mathrm{xm}=44$
$\mathrm{ym}=14$
xshift $=.54$
$y p=704$
FOR $x=\emptyset$ TO 644
$\operatorname{IF} \operatorname{LV}(x, \varnothing)<\emptyset$ THEN $\operatorname{Lv}(x, \varnothing)=\varnothing 4$ NEXT $x 4$
FOR $Y=\emptyset$ TO 634
$\operatorname{IF} \operatorname{Lv}(\varnothing, y)<\varnothing$ THEN $\operatorname{Lv}(\varnothing, y)=\varnothing<$ FOR $x=\emptyset$ TO 634
IF Lv $(x+1, y+1)<\emptyset$ THEN Lv $(x+1$,
$y+1)=\emptyset 4$
$\operatorname{Lv}=\operatorname{Lv}(x, y)+\operatorname{Lv}(x+1, y)+\operatorname{Lv}(x, y$
$+1) 4$
$L v=(L v+L v(x+1, y+1)) / 44$
$a=x: b=y^{4}$
$r x l=x m$ * $a+x \operatorname{shift} * b \notin$
$r y l=y m * b+y p-L v(a, b) \notin$
GOSUB getshade: 4
shadel $=$ shade 4
$a=x+14$
$r \times 2=x m * a+x \operatorname{shift} * b_{4}$
$r y 2=y m * b+y p-\operatorname{Lv}(a, b) \&$
GOSUB getshade: 4
shade $2=$ shade 4
$a=x: b=y+14$
$\mathrm{rx3}=\mathrm{xm}$ * $\mathrm{a}+\mathrm{xshift}$ * b 4
ry3 $=y m * b+y p-L v(a, b) \leftarrow$
GOSUB getshade: 4
shade $3=$ shade 4
$\mathrm{a}=\mathrm{x}+14$
rx4 = xm * $a+x \operatorname{shift}$ * $b 4$
$r y 4=y m * b+y p-L v(a, b) \psi$
GOSUB getshade: 4
shade4 $=$ shade 4
$a=x+.5: b=y+.54$
$r x=x m * a+x \operatorname{shift} * b \not b$
$r y=y m * b+y p 4$
$a=x: b=y \not{ }^{4}$
ry $=$ ry - Lv ${ }^{4}$
AREA (rx,ry)
AREA $(r \times l, r y l) 4$
AREA $(r \times 2, r y 2) 4$
COLOR shadel4
AREAFILL 4
AREA $(r x, r y) \leftarrow$
AREA $(r \times 2, r y 2) 4$
AREA $(r \times 4, r y 4) 4$
COLOR shade24
AREAFILL4
AREA $(r x, r y) \&$
AREA (rxl, ryl) 4
AREA (rx3, ry3) 4
COLOR shade34
AREAFILL 4
AREA ( $\mathrm{rx}, \mathrm{ry}$ ) 4
AREA $(r \times 3, r y 3) 4$
AREA $(r \times 4, r y 4) 4$
COLOR shade44
AREAFILL 4
NEXT $x 4$
NEXT $\mathrm{y}^{4}$

```
ender:&
aS = INKEY$4
IF aS = "s" THEN GOTO savepic&
IF aS <> " " THEN GOTO ender&
end2:4
WINDOW CLOSE 34
SCREEN CLOSE 24
WINDOW OUTPUT l&
END4
getshade: 4
c = x + 1 - (b-y)4
d = y + (a-x) 4
xc}=\textrm{x}+.5
yc = Y+.54
xrunl = xc - as
xrun2 = xc - ct
yrunl = yc - b4
yrun2 = yc - d4
risel = Lv - Lv (a,b) &
rise2 = Lv - Lv(c,d)
yrise = ABS(risel*xrun2 - rise2
*xrunl) <
yrun = ABS(yrunl*xrun2 - xrunl*y
run2)&
IF yrun = yrise THEN yrun = 1:yr
ise = 14
xrise = ABS(risel*yrun2 - rise2*
yrunl)4
xrun = ABS(xrunl*yrun2 - yrunl*x
run2)4
IF xrun = xrise THEN xrun = l:xr
ise = 14
xrise = xrise / 24
yrise = yrise / 24
xshade = l-ABS(xrise / (xrun + x
rise))&
yshade = l-ABS(yrise / (yrun + y
rise))&
shade = 14*xshade*yshade+1 &
IF Lv > snowLine THEN shade = sh
ade + 164
IF Lv <= Ø THEN shade = 164
RETURN4
savepic:4
rastport& = WINDOW(8)&
bitmap& = PEEKL(rastport&+4)4
topLine = 60 - INT(maxLv) 4
IF topLine < Ø THEN topLine = Ø4
topadd = topLine * 40%
FOR a = 0 TO 44
pLane&(a) = PEEKL(bitmap& + 8 +
a*4)+topadd4
NEXT4
bottomLine = 1444
Lines = bottomLine - topLine4
OPEN fiL$ FOR OUTPUT AS 14
aS = MKL$(Lines * 4\emptyset * 5 + 144) 4
PRINT#1,"FORM";as;"ILBMBMHD";MKL
$(20);4
PRINT#1,MKI$(320);MKIS(Lines);MK
LS(\varnothing);4
PRINT#1,CHRS( 5 ) ; MKIS ( Ø);CHRS ( }0)
4
PRINT#1,MKI$( |); CHRS (1Ø); CHR$ (11
);4
PRINT#1,MKI$(32\sigma);MKI$(2Ø\varnothing);4
PRINT#1,"CMAP";MKL$(96);4
FOR a = Ø TO 314
PRINT#1,cmap$(a);4
NEXT4
PRINT#1,"BODY";MKLS(Lines * 40 *
5);4
FOR a = 1 TO Lines&
FOR p = Ø TO 44
FOR b = Ø TO 39 STEP 44
PRINT#1,MKL$(PEEKL(pLane&(p) + b
));4
NEXT b&
POKEL pLane&(p),-14
pLane&(p) = pLane&(p) + 40&
NEXT p&
NEXT a<
CLOSE4
GOTO end24
4

\title{
Pop-Up AsCli Table For IBM
}

\author{
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 memoryresident 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 AUTOEXECBAT 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 caus－ ing a character to appear on the screen．Here is an explanation of those abbreviations：
NU null character（zero）
BP beep

\section*{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 pro－ grammers 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．

\section*{Customizing ASCIITBL．COM}

The Alt－A key combination was chosen because the letter A sug－ gests ASCII．Should you want to use this program along with some other memory－resident program which also uses Alt－A，you can sub－ stitute another letter for \(A\) ．The number in parentheses in line 30 is the extended scan code for the key－ press that activates the program．To change the \(A\) in Alt－A to some other letter，replace the number in paren－ theses with a number from the fol－ lowing table．
\begin{tabular}{llll}
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
\end{tabular}

\section*{ASCIITBL．COM Filemaker}

For instructions on entering this programs， please refer to＂COMPUTEI＇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 Righte Re served．＂
MP 5 FOR \(Z=1\) TO 15øø：NEXT
BO 6 CLS
DI \(1 \varnothing\) OPEN＂ASCIITBL．COM＂FOR OU TPUT AS 1
ML 26 PRINT\＃1，CHR\＄（\＆HE9）；CHR\＄（\＆H Bø）；CHR（ 8 H 1\()\) ；
KH \(3 \emptyset\) PRINT\＃1，CHR\＄（3 \({ }^{(1)}\) ；
If 4ø FOR \(N=1\) TO 6：PRINT\＃1，CHR\＄（ （b）；：NEXT
NN \(5 \emptyset T=\emptyset: F O R \quad J=1\) TO 646：READ A\＄ ：\(N=\) VAL（＂\(\& H^{\prime}\)＂\(+A\) ）
FD \(6 \emptyset T=T+N:\) PRINT\＃1，CHR（N）；：NEX T：CLOSE 1
NH \(7 \emptyset\) IF \(T=56547\) ！THEN PRINT＂ASC IITBL．COM SUCCESSFULLY CRE ATED！＂：END
 IN DATA STATEMENTS 事音嬂＂ ：END
ID 9ø DATA øø，Øø，øø，øø，ஏø，Øø，83， ø2，2C， 28
HH 1 Øø DATA 2D，29，2A，2E，1E，AA，øF ，4E，55， \(6 A\)
IB \(11 \emptyset\) DATA \(14,42,5 \emptyset, 4 A, 15,54,42\) ，EA，15，4C
AH 126 DATA \(46,8 A, 16,48,4 D, 2 A, 17\) ，46，46，CA
EE 130 DATA \(17,43,52,38,12,52,54\) ，D8，12，4C
FJ \(14 \varnothing\) DATA \(54,78,13,55,59,18,14\) ，44，4E，5ø
BK \(15 \varnothing\) DATA \(72,65,73,73,29,5 B, 45\) ，73，63，5D
H0 \(16 \emptyset\) DATA \(2 \emptyset, 74,6 F, 20,63,6 F, 6 E\) ，74，69，6E
UL 17ø DATA 75，65，2E，2E，2E，2E， \(8 \varnothing\) ，उE，ø8，ø1
B1 189 DATA \(6 \varnothing, 75,22, F B, 59,53,51\) ，52，56，57
HC \(19 \varnothing\) DATA 1E，Ø6，E4，6Ø，2E，3A，Ø6 ， \(63,61,75\)
OF \(2 ø \emptyset\) DATA ஏ8，B4，ø2，CD，16，A8，ø8 ，75， \(6 \mathrm{D}, 67\)
CB \(21 \varnothing\) DATA \(1 F, 5 F, 5 E, 5 A, 59,5 B, 58\) ，2E，FF，2E
IC \(22 \varnothing\) DATA \(\varnothing C, \varnothing 1, E B, D F, \varnothing \varnothing, \varnothing E, 1 F\) ，\(\varnothing E, \emptyset 7, B 4\)
CL \(23 \varnothing\) DATA øF，CD， \(1 \emptyset, 3 C, \emptyset 2,74,11\) ，3C，63， 74
LD \(24 \emptyset\) DATA \(\varnothing \mathrm{D}, 3 \mathrm{C}, \varnothing 7,74, \boxed{69}, \varnothing 7,1 F\) ，5F，5E，5A
OB 259 DATA \(59,5 B, 58, C F, 88,3 E, 67\) ， \(01, C 6,06\)
 ，89， \(6 E, 69\)
B8 27ø DATA \(\varnothing 1, \mathrm{B4}, \varnothing 1, \mathrm{B5}, 2 \emptyset, \mathrm{CD}, 1 \emptyset\) ， \(8 \varnothing, 3 E, \emptyset 4\)
IE \(28 \emptyset\) DATA \(\varnothing 1, \varnothing \emptyset, 75, \varnothing 3, E 8,84, \varnothing \emptyset\) ，8B，3E， 1 ©
DE \(29 \varnothing\) DATA \(\emptyset_{1}, E 8,41, \varnothing \emptyset, B B, A \emptyset, \emptyset F\) ，EB，55，øø
KA उøø DATA 8ø，ЗЕ，ø4，ø1，øø，75，øЗ ，EB，7C，øø
IC \(31 \emptyset\) DATA B4，\(\varnothing \varnothing, C D, 16,3 C, 1 B, 75\) ， \(\mathrm{FB}, \mathrm{BD}, \mathrm{3E}\)
MK \(32 \emptyset\) DATA \(\varnothing 4, \varnothing 1, \varnothing \varnothing, 75, \emptyset 3, E 8,5 B\) ，\(\varnothing \varnothing, B B, \varnothing \varnothing\)

HM \(33 \emptyset\) DATA Øø，E8，З3，Øø，8ø，ЗE，\(\varnothing 4\) ， 1 1，Øロ，75
CJ \(34 \emptyset\) DATA \(\varnothing 3, E 8,5 A, \emptyset \emptyset, B 4, \emptyset 1,8 B\) ，\(\varnothing \mathrm{E}, \emptyset 9, \varnothing 1\)
 ，EB，BE， BA
8J \(36 \emptyset\) DATA \(1 E, \varnothing 7, \varnothing 1,32, F F, 57, E 8\) ，2A，øø， \(8 B\)
AB \(37 \emptyset\) DATA \(F 7,5 F, 1 E, 8 E, 1 E, 65,61\) ，B9，Dø， 67
IP 38 D DATA FC，F3，A5， \(1 F, C 3,8 B, 36\) ，1ø， \(1, ~ ஜ 3 ~\)
PE \(39 \emptyset\) DATA F3，8A，1E，\(\emptyset 7, ~ ஏ 1,32, F F ~\) ，EB，6B，øø
OD \(4 \varnothing \varnothing\) DATA \(8 E, \emptyset 6, \varnothing 5, \emptyset 1, F C, B 9, D \varnothing\) ， \(67, F 3\), A5
OD \(41 \varnothing\) DATA C3，B8，\(\varnothing \varnothing, 1 \varnothing, F 7, E 3,8 B\) ， \(\mathrm{FB}, \mathrm{CJ}, \mathrm{BA}\)
EL \(42 \emptyset\) DATA DA，ø3，EC，AB，ø8，74，FB ，83，EA，\(ø 2\)
DA \(43 \emptyset\) DATA \(B \emptyset, 25, E E, C 3, B 4, \emptyset F, C D\) ，1 \(\emptyset, 8 \mathrm{D}, 1 \mathrm{E}\)
CL \(44 \emptyset\) DATA \(12, \emptyset 1, D 7, B A, D 8, \varnothing 3, E E\) ，C3，E4， 61
FF \(45 \emptyset\) DATA \(8 A\) ，Eø，øC，8ø，E6，61， 8 A ，C4，E6， 61
NO \(46 \varnothing\) DATA FA，Bø，2ø，E6，2ø，FB，C3 ，C6，Ø6，ø4
EJ \(47 \varnothing\) DATA ø1，øø，C7，ø6，ø5，ø1，øø ，B8，B4，\({ }^{\circ} \mathrm{F}\)
ED \(48 \emptyset\) DATA CD， \(19,3 C, 67,75,11, \mathrm{FE}\) ，ø6， \(54, ~ ø 1 ~\)
FP 49ø DATA 81，2E，ø5，ø1，øø，ø8，B9 ，ØD，øC，3C
OK 5øø DATA \(\varnothing 7, E B, \boxed{ } 1, \mathrm{B9}, \varnothing 7, \emptyset 6, \mathrm{B4}\) ，\(\varnothing 1, C D, 1 \varnothing\)
BK \(51 \varnothing\) DATA B9，Dø，ø7，8B， \(3 E, 1 \varnothing, \varnothing 1\) ，81，C7，Aø
OE \(52 \emptyset\) DATA \(\varnothing \mathrm{F}, \mathrm{BB}, 2 \emptyset, \boxed{6}, \mathrm{~F}, \mathrm{AB}, 8 \mathrm{~B}\) ， \(3 \mathrm{E}, 1 \varnothing, \varnothing 1\)
QN \(53 \emptyset\) DATA \(81, C 7, A 2, \emptyset F, 8 B, D F, 8 B\) ，FB，B9， 18
IJ \(54 \varnothing\) DATA øø，Aø，ØB，ø1， \(3 \mathrm{C}, 17,77\) ， \(69,83, E F\)
NE \(55 \emptyset\) DATA \(\emptyset 2, C 6, \emptyset 5, B 3,83, C 7, \emptyset 2\) ，B2， \(6 \varnothing, 3 C\)
JE 569 DATA C8，72， \(99, C 6,65,32,2 C\) ， \(\mathrm{CB}, \mathrm{B2}, \mathrm{D}_{1}\)
HP \(57 \emptyset\) DATA EB，øB， \(3 C, 64,72,67, C 6\) ， \(05,31,2 C\)
DB \(58 \emptyset\) DATA \(64, B 2, \emptyset 1,47,47, D 4, \emptyset A\) ，65，3ø，30
6K \(59 \varnothing\) DATA 8פ，FC，3פ，75，Ø7，8ஜ，FA ，\(\varnothing \emptyset, 75, \varnothing 2\)
DE \(6 \emptyset \emptyset\) DATA B4，2ø，88，25，47，47， 88 ， \(65,47,47\)
FA 61ø DATA 47，47，Aø， \(0 B, \varnothing 1,88, \varnothing 5\) ，47，47，47
CE 626 DATA \(47, C 6, \varnothing 5, B 3,81, C 7,94\) ，Бø，8ø，3E
OF \(63 \emptyset\) DATA øB，Ø1，FF，74，øB，FE，\(\varnothing 6\) ，ØB，Ø1，E2
NH \(64 \varnothing\) DATA 9C， \(83, C 3, \varnothing E, E B, 92,8 D\) ，1E，19， 61
 ， \(3 \mathrm{E}, 1\) ， 1.61
EA \(66 \emptyset\) DATA \(8 B, \varnothing \varnothing, \emptyset 3, F 8,46,46,8 A\) ，\(\varnothing \varnothing, 88,65\)
HD 67ø DATA \(46,47,47,8 A, \varnothing \varnothing, 88,65\) ，46，E2，E8
PJ \(68 \emptyset\) DATA \(8 B, 3 E, 1 \varnothing, \varnothing 1,81, C 7, D 8\) ，1E，8D， 1 E
QK \(69 \varnothing\) DATA \(45, \varnothing 1, B 9,1\) ，\(\varnothing \varnothing, B E, \varnothing \varnothing\) ，ஜஜ，8A，Øஜ
FL \(7 ø \emptyset\) DATA \(88,95,46,47,47, E 2, F 7\) ，B4，35，Bø
FC \(71 \emptyset\) DATA \(99, C D, 21,89,1 E, \varnothing C, \varnothing 1\) ，BC，ø6，øE
LP \(72 \emptyset\) DATA \(\emptyset_{1}, \mathrm{B4}, 25, \mathrm{~B} \mathrm{\emptyset}, \varnothing 9,8 \mathrm{D}, 16\) ，5F， ®1，\(^{\text {CD }}\)
ON 730 DATA \(21, \mathrm{BA}, \mathrm{C}, 21, \mathrm{CD}, 27\) ©

\title{
XpressCard Filing System For The Commodore 64
}

\author{
Robert Bixby
}

Though it's small in size-only 2 K this Commodore 64 filing program packs plenty of wallop. "XpressCard" lets you store an amazing 60 K 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 2 K in length. It's the electronic equivalent of a conventional card file, providing over 60 K 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: OFF8
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.

\section*{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 haver.'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-ahalf 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 \(\mathrm{f7}\) 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.

\section*{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 \(f 7\) 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 SHIFTCLR/HOME.

\section*{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 f5mode 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 f 6 to move to card 001.) Finally, press \(f 5\) 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 match-
ing 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 \(\mathrm{S} N(\mathrm{~S}\) 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 pat-tern-insertion provides an easy way to do it.

Insert takes longer for lowernumbered 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 \(X\) pressCard 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.

\section*{Miscellaneous Functions}

The \(f 4\) and \(f 1\) offer two additional features. The \(f 4\) key erases the data in every card from the current card to card 237. Since this drastic action is irreversible, \(X\) pressCard 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.

\section*{XpressCard}

Please refer to the "MLX" article in this issue before entering the following program.
ø8ø1: \(\emptyset_{B} \quad \emptyset 8 \mathrm{FF}\) FF \(9 \mathrm{E} \quad 32 \quad 30 \quad 39 \mathrm{EF}\) Ø8ø9: 39 Øø 31 Ø8 FF FF 8F 14 8F
 Ø819:50 \(52 \begin{array}{llllllll} & 5 \mathrm{~F} & 47 & 52 & 41 & 4 \mathrm{D} & 2 \emptyset & 96\end{array}\)
\(\begin{array}{llllllllll}\text { Ø821: } 42 & 59 & 20 & 52 & 4 \mathrm{~F} & 42 & 45 & 52 & 32\end{array}\) ø829:54 204249584259 øø 42 Ø831: øø Øø A5 Ø1 29 FE 85 Ø1 57 Ø839:A9 8Ø 8D 8A Ø2 A9 ØØ 85 D4 Ø841:19 85 FD 8D B3 Ø2 209755 Ø849: ØB A9 1ø 85 1A 85 FE A9 32 Ø851: ØF 8D 2Ø DØ 8D 21 DØ \(2 \emptyset 1 \emptyset\) Ø859: 4 Ø ØF AD BE Ø2 C9 2 F FØ 75 Ø861:1C A9 2F 8D BE Ø2 A9 øø F9 Ø869:8D BF Ø2 A9 28 8D C \(\emptyset \quad \emptyset 2\) Ø6 ஏ871:A9 Ø1 8D C1 Ø2 A9 Ø6 8D B4 Ø879: С2 Ø2 2ø 95 øС 2 Ø С5 ØВ 4 Ø Ø881: 2Ø 5A ØF AØ ØØ 84 C6 8C \(5 \emptyset\)
 Ø891: Fの F8 C9 11 DØ 18 AD BD A2 ø899: Ø2 \(18 \quad 69 \quad 27 \quad 90 \quad\) Ø8 A9 13 5B Ø8A1: \(2 \emptyset\) D2 FF 4C 81 Ø8 8D BD \(4 \emptyset\) Ø8A9:ø2 A9 11 4C 34 Ø9 C9 87 EC Ø8B1: DØ Ø3 4C BB ØC C9 91 DØ \(A B\) Ø8B9: 18 AD BD Ø2 \(38 \mathrm{E} 929 \mathrm{~B} \quad 85\) ø8Cl: 08 A9 13 2Ø D2 FF \(4 \mathrm{C} ~ 8155\) Ø8C9: Ø8 8D BD Ø2 A9 91 4C 3479 Ø8D1: Ø9 C9 9D DØ 1A CE BD Ø2 23 Ø8D9: CE BD Ø2 AC BD Ø2 CØ FE 42 Ø8E1: DØ ØA AØ ØØ 8C BD Ø2 A9 F9 Ø8E9:13 4C F7 ø8 4C 34 Ø9 C9 25 Ø8F1:94 DØ 03 4C 18 ØE C9 1345 Ø8F9: DØ ø7 AØ Øø A9 13 4C 4B C5 Ø9Ø1: Ø9 C9 14 DØ Ø3 4C 43 ØE 77 Ø9ø9:C9 8D Dø Ø3 4C F7 ØD C9 D3 Ø911:93 DØ ØB 2Ø 62 ØF A9 13 3A Ø919:4C F7 Ø8 4C 81 ø8 C9 ØD E1 Ø921: DØ Ø3 4C 8B Ø8 C9 8590 Al Ø929: ØA C9 8D BØ Ø6 20181 ØB 8D Ø931: 4C 81 ø8 AC BD Ø2 C8 Cø DD Ø939: FF D \(\varnothing\) ØF 2 Ø D2 FF \(2 \varnothing 74 \mathrm{AE}\) Ø941: ØB \(2 \emptyset 68\) ØD \(2 \emptyset 62\) ØF 4C B3 ஏ949: ø8 ØE 8C BD Ø2 \(2 \emptyset\) D2 FF 86
 Ø959:11 1111111111606059 Ø961:60 60 60 60 60 60 6060 73

 Ø \(979: 2 \emptyset \quad 2 \emptyset\) D8 DØ \(5245 \quad 5353\) 6D

 Ø991: \(2 \emptyset\) ØØ A2 ØØ 86 Ø2 8E B9 1B Ø999: 02 A9 41 8D EB 07 E6 FE 6Ø Ø9A1:A5 FE C9 CF 9 Ø \(0685 \quad\) Ø2 26 Ø9A9: A9 CF 85 FE BD 8B 69 FD 44 Ø9B1: Ø7 \(2 \varnothing\) D2 FF E8 4C AD Ø9 86 Ø9B9: AØ Øø 84 C6 \(2 \varnothing\) CF FF 99 F2 Ø9C1: EC \(\emptyset 7 \mathrm{C} 8 \mathrm{C} \emptyset \quad \emptyset \mathrm{F}\) BØ Ø4 C9 3 E Ø9C9: ØD DØ F1 Cø Ø2 Bø Ø1 \(6 \emptyset 16\) Ø9D1:8C E8 97 A9 Ø8 A2 \(98 ~ A \emptyset ~ 5 B ~\)
 Ø9E1:EB AØ 6720 BD FF A9 \(9 \emptyset 36\) Ø9E9:85 22 A9 \(1085 \quad 23\) A9 22 AB Ø9F1: A6 FD A4 FE \(2 \varnothing\) D8 FF \(2 \varnothing \mathrm{DF}\) Ø9F9: CC FF AD B9 Ø2 DØ Ø4 A5 C4 ØAØ1: Ø2 FØ 42 AØ ØØ 84 Ø2 A9 64 ØA09:10 85 1A A9 4185 FE A9 2C ØAll:CF 85 1C 84 1B 84192077 ØA19:52 ØF B1 19 8D C3 Ø2 \(2 \emptyset 81\) ØA21:13 ØE AD C3 Ø2 91 1B C8 89 ØA29: D \(\mathrm{F} \emptyset \mathrm{E} 6\) 1A E6 1C A5 1C 6 F ØA31: DØ E8 2Ø 5A ØF AD B9 Ø2 36 ØA39: DØ ØB A9 42 8D EB 97 8D 89 ØA41: B9 Ø2 4 4C D4 \(096 \emptyset \quad 93\) 4C C6 ØA \(49: 4 \mathrm{~F} 4144\) 3A \(2 \emptyset\) Øø A2 \(\quad\) Øø C7 ØA51: BD 47 ØA \(\mathrm{F} \emptyset \quad 97 \quad 2 \emptyset\) D2 FF C 4 ØA59:E8 4C 51 ØA A8 84 C6 \(2 \emptyset\) C4 ØA61:CF FF 99 EB 07 C8 C9 ØD 4B ØA69: DØ F5 CØ Ø2 BØ Ø1 6Ø 8C 72 ØA71: E8 Ø7 A9 Ø8 A2 Ø8 Aの FF E7 ØA79: 20 BA FF AD E8 67 A2 EB BB ØA81 : A \(\varnothing 0720\) BD FF A9 \(0 \varnothing\) A2 D 9 ØA89:FF AØ FF \(2 \emptyset\) D5 FF \(2 \emptyset\) CC 83 ØA91: FF AD EB 07 C9 42 Dø 2A 22 ØA99:A9 41 8D EB Ø7 AØ øø 8482 ØAAl: 1984 1B A9 1085 1C A9 D9 ØAA9:CF 85 1A 2052 ØF \(2 \emptyset 136 \mathrm{E}\) ØAB1:ØE C8 Dø FA E6 1A E6 IC 52 ØAB9:A5 1A DØ F2 \(2 \emptyset\) 5A ØF 4 C 45

ØAC1: 73 ØA 6020 CC FF A9 \(\varnothing \varnothing\) D9 ØAC9: AØ FF A2 FF 20 BD FF A9 24 ØADl:ø4 AA AØ 0720 BA FF \(2 \varnothing 23\) ØAD9:CØ FF A2 Ø4 \(2 \varnothing\) C9 FF A9 B4 ØAE1:1B \(2 \varnothing\) D2 FF A9 øø \(2 \varnothing\) D2 46 ØAE9:FF AØ øø A2 Øø B9 Øø Ø4 3B ØAF1:C9 \(2 \varnothing\) Bø \(\varnothing 5 \quad 69404 \mathrm{C} \quad 9947\) ØAF9:ØB C9 4ø 9ø ØВ C9 6ø Bø ø8 ØВø1:ø5 69 8ø 4С ø9 ØВ А9 \(2 \varnothing\) Вø ØBø9:2Ø D2 FF C8 CC BF Ø2 FØ CA ØB11:øE E8 EC Cø \(629 \varnothing\) D6 A9 BB ØB19:øD \(2 \varnothing\) D2 FF 4C EC ØA A9 EB ØB21:øD \(2 \varnothing\) D2 FF C8 CC C1 Ø2 1F ØB29:90 F5 20 CC FF 4C Ø8 ØE 25 ØВ31:C9 85 Dø 27 A2 øø \(2 \varnothing 52 \mathrm{Cl}\) øB39:øF BD Dø ø6 85 Ø2 BD øø \(7 \varnothing\) ØB41:FE 9D Dø Ø6 BD Øø FF 9D 44 ØB49:øØ FE A5 Ø2 9D Øø FF E8 C9 ØB51:DØ E7 2Ø 5A ØF A9 13 2б D8 ØB59:D2 FF 60 C9 8A Dø 042041 ØВ61:68 øС 60 C9 8B DØ 08 A9 Bø ØB69:10 85 FE \(2 \varnothing\) C5 ØB 6Ø C9 AF ØB71:88 Dø 1320 Bl ØB E6 FE EA бB79:A5 FE C9 FD 9084 A9 1033 ØB81:85 FE \(2 \varnothing\) C5 ØB 6Ø C6 FE EØ ØB89:A5 FE C9 1ø Bø \(\varnothing 4\) A9 FC 52 ØB91:85 FE \(2 \varnothing\) C5 ØB \(^{6} 6 \varnothing\) Aø \(\varnothing \varnothing\) A5 ØB99:A9 D8 85 1A A9 Øø 8519 7E ØBAl:A9 øø 9119 C8 Dø F9 E6 B4 ØBA9:1A A5 1A C9 DC 90 Fl 6083 ØBB1:2ø 15 ØC \(2 \emptyset 52\) ØF Aø øø Bø øBB9: B9 øø ø4 91 FD C8 Dø F8 F3 ØBCl:2Ø 5A ØF \(6 \varnothing\) AØ Ø1 \(2 \varnothing 45\) F4 ØBC9:øF \(2 \varnothing 52\) ØF AØ Øб Bl FD 11 ØBD1:99 øø ø4 C8 Dø F8 \(2 \varnothing 15\) 31 ØBD9:øC Aø Øø E6 FE A5 FE C9 E2 ØBEl:FD \(9 \varnothing 04\) A9 1085 FE Bl 7C ØBE9:FD \(9940 \quad 65\) C8 Dø F8 A5 DE ØBF1:FE C9 10 Dø 04 A9 FD 8551 ØBF9:FE C6 FE 2ø 5A ØF A9 \(2 \varnothing\) A5 øCø1:8D FF 04 8D 9065 8D 04 5C øCø9:ø5 Aø øø 99 4ø ø6 C8 Cø Dl øC11:90 90 F8 60 A5 FE 38 E9 3E øC19:øF A2 2 F 38 E9 64 E8 90 ØE øC21:ø3 4C 1C øC 186964 8E CF ØC29:ø1 Ø5 A2 2 F 38 E9 ØA E8 Bø øC31:90 Ø3 4C 2D øC 1869 øA 4C øC39:8E ø2 ø5 A2 \(2 \mathrm{~F} \quad 38\) E9 Ø1 13 øC41: E8 9ø ø3 4С 3 E øС 8Е Ø3 59 ØC49:ø5 6ø 85 Ø2 AC BD ø2 B9 E6 øC51:øø Ø4 8D B6 ø2 A9 6499 Аø øC59:øø ø4 A9 øø 85 D4 AD B6 39 øC61:ø2 99 Øø Ø4 A5 Ø2 6Ø \(2 \varnothing 37\) ØC69:5A ØF AØ øø B9 79 ØC FØ 43 ØC71:13 2ø D2 FF C8 4C 6D øC D3 øC79:13 43 4C \(4541522 \varnothing 419 E\) øC81:4C 4C 3F øø A9 øø 85 C6 D9 ØC89:2の E4 FF Fø FB C9 59 Fø A4 øC91:ø3 4C ø5 øE 2ø 52 ØF A5 CD ØC99:FE 85 1A Aø \(\emptyset \emptyset 8419\) A9 CD ØCAl:2Ø 9119 C8 DØ FB E6 1A 3C øCA9:A5 1A C9 FE \(9 \varnothing\) F1 2ø 5A 2B ØCB1: ØF A9 9320 D2 FF \(2 \varnothing\) C5 CC øCB9:øB 6Ø A9 Ø2 8D \(2 \varnothing\) Dø A5 F8 øCC1:C5 C9 4ø Fø F5 C9 Ø1 Dø EF øCC9:ø3 4C ø8 ØE C9 ØB DØ Ø6 7A ØCDl:2Ø 6D ØF 4C E8 ØF C9 1427 øCD9: Dø ø3 4C E8 ØF C9 3F Dø 22 ØCE1:ø7 A5 Ø1 ø9 Ø1 85 Ø1 \(6 \varnothing 18\) ØCE9:C9 ØA Dø ø6 2Ø 5B ØE 4C BA øCF1:ø5 ØE C9 21 Dø Ø6 2068 A2 ØCF9:øD 4C Ø5 ØE C9 12 DØ Ø6 6B øDø1:2ø 97 ØD 4C 05 ØE C9 158 8 øDø9:DØ ØB AD 8D ø2 DØ Ø3 4C 82 ØD11:AØ ØE 4C D3 ØE C9 11 DØ \(5 \varnothing\) ØD19:ø3 4C E8 ØD C9 29 Dø ø3 4D ØD21:4C C4 ØA C9 ØD Dø ø6 \(2 \varnothing 48\) ØD29:93 ø9 4C ø5 øE C9 2A Dø E5 ØD31:ø6 \(2 \varnothing 4 \mathrm{~F}\) ØA 4C 95 ØE C9 3D ØD39:36 DØ 29 AD 8D Ø2 DØ 67 BF ØD41:A9 4085 FE 4 C Ø5 ØE C9 3D ØD49: Ø1 D \(\varnothing 97\) A9 \(7 \varnothing 85 \mathrm{FE} 2 \varnothing\) 4B ØD51:ø5 ØE C9 Ø2 Dø Ø7 A9 Aの 61 øD59:85 FE 4C ø5 øE A9 DØ 85 ØE

ØD61:FE 4C Ø5 ØE 4C Cø ØC A9 B6 ØD69: 07 8D \(2 \varnothing\) D \(02 \varnothing\) Bl ØB \(2 \varnothing 79\) ØD71:52 ØF A9 øø 851985 1B 64 ØD79:A9 FD 85 1A A9 FC 85 1C A2 ØD81:AØ øø \(2 \varnothing 13\) ØE C8 Dø FA 51 ØD89:C6 1C C6 1A A5 1A C5 FE A8 ØD91: Dø EE 2ø 5A ØF 6Ø A9 ø6 CC ØD99:8D \(2 \varnothing\) DØ \(2 \varnothing 52\) ØF A9 øø Cø ØDA1: 851985 1B A5 FE 85 1A 75 ØDA9:18 69 Ø1 FØ 1E 85 1C AØ 39 ØDB1:øØ B1 1999 Dø Ø6 C8 Dø F5 ØDB9:F8 Aø øø \(2 \varnothing 13\) ØE C8 Dø AD ØDC1:FA E6 1C E6 1A A5 1C C9 6E ØDC9:FD 9ø EE 4C 93 øD 8C BD 51 ØDD1:ø2 Aø øø B1 19 8D C3 ø2 B8 ØDD9:2ø 13 øE AD C3 ø2 91 1B C9 ØDE1:C8 Dø Fø AC BD 0260 B9 ED ØDE9:DØ ø6 99 øø Ø 4 C8 Dø F7 FD ØDFl:2Ø B1 ØB 4C ø8 ØE Aø øø 68 ØDF9: B9 øø Ø1 99 Dø ø6 C8 Dø øC
 ØEØ9: ØF 8D \(2 \emptyset\) DØ 8D 21 D Ø 4C FF ØE11:81 ø8 B1 1B 911960 Aø 2A ØE19:FF 88 B9 Dø 06 C8 99 Dø F2 ØE21:ø6 88 DØ F5 AD FF Ø4 8D DE ØE29:DØ Ø6 AØ FF 88 B9 Øø Ø4 72 ØE31:C8 99 øø ø4 88 CC BD 62 4D ØE39:Dø F2 A9 \(2 \emptyset 99\) Øø Ø4 4C D2 ØE41:8B ø8 AC BD 02 C8 B9 øø 3D ØE49: Ø4 88 99 Øø Ø4 C8 Dø F5 97 ØE51:A9 2ø 8D FF 04 A9 9D 4C 4A øE59:D2 ø8 A9 ø4 8D \(2 \varnothing\) Dø \(2 \varnothing\) Ø5 ØE61:52 øF A9 1ø 85 1A 85 1C 5C ØE69:A9 øø 851985 1B A8 Bl 38 ØE71:19 2ø 19 ØF 85 Ø2 E6 1C 54 ØE79:A5 1C C5 FE Bø ØF B1 1B 58 ØE81:2ø 19 ØF C5 ø2 Bø EF \(2 \varnothing\) Ø5 ØE89:CF ØD 4C 7ø øE E6 1A A5 47 ØE91:1A 85 1C C5 FE 90 D8 A9 91 ØE99:1ø \(85 \mathrm{FE} 2 \emptyset\) 5A ØF 6ø A2 73 ØEA1:FF E6 FE C9 FD 90616088 ØEA9:2Ø C5 ØB BD Dø Ø6 C9 \(2 \varnothing\) D6 ØEB1:Dø 18 CA \(3 \varnothing\) Ø3 4C AC ØE 49 øEB9:4C ø8 ØE E6 FE A5 FE C9 84 ØEC1:FD 9ø E5 A9 \(1 \varnothing 85 \mathrm{FE} 4 \mathrm{C} 39\) ØEC9: 55 ØE DD øø 94 Dø EC 4C 31 ØED1:B3 ØE A2 Øø BD Dø Ø6 C9 A6 ØED9:2Ø FØ Ø4 E8 4C D5 ØE 86 AD ØEE1: 02 E6 FE A5 FE C9 FD \(9 \varnothing\) 9E ØEE9: 07 A9 1085 FE 4 C Ø5 ØE 8F ØEF1:2ø C5 ØВ A2 øø АØ øø B9 57 ØEF9:øØ Ø4 8D BB Ø2 BD Dø Ø6 33 ØFø1:CD BB 02 Fø Ø8 A2 øø C8 D7 ØFø9:Dø ED 4C E2 ØE E8 E4 ø2 A2 ØF11:FØ DB C8 Fø CC 4C F8 ØE 5E ØF19:C9 \(2 \emptyset\) Dø 97 Cø Øø FØ 1C B2 ØF21:A9 øø 60 Bø ø3 186940 B6 ØF29:C9 5B Bø 1ø C9 \(41 \mathrm{~B} \emptyset\) ØE DC ØF31:C9 3A Bø ø8 C9 \(3 \varnothing 9004\) 8D ØF39:18 69 2B 60 A9 FF \(6 \varnothing 2057\) ØF41:5A ØF Aø \(\emptyset \emptyset\) B9 54 Ø9 Dø 66 ØF49:ø1 60 2ø D2 FF C8 4C 4532 ØF51: ØF 78 A5 Ø1 29 FC 85 Ø1 23 ØF59:6Ø A5 Ø1 ø9 ø2 85 Ø1 5842 ØF61:60 Aø øø A9 \(2 \varnothing 99\) øø Ø4 DD ØF69:C8 Dø FA 6ø A9 Ø1 A2 ø8 24 ØF71:AØ Øø \(2 \varnothing\) BA FF A9 Ø1 AØ D8 ØF79:øF A2 DE \(2 \varnothing\) BD FF \(2 \emptyset\) Cø 94 ØF81:FF A2 \(612 \emptyset\) C6 FF A9 9387 ØF89:2ø D2 FF \(2 \varnothing\) E4 FF \(2 \varnothing\) E4 BA ØF91:FF \(2 \varnothing\) E4 FF \(2 \varnothing\) E4 FF \(2 \varnothing\) Ø9 ØF99:E4 FF \(2 \varnothing\) E4 FF \(2 \varnothing\) E4 FF C6 ØFA1:C9 42 Dø Ø3 4C D1 ØF C9 11 ØFA9:22 Dø F2 \(2 \varnothing\) E4 FF Fø Ø8 7E
 ØFB9:A9 ØD \(2 \varnothing\) D2 FF 4C 92 ØF 86 ØFCl:2Ø D2 FF A5 C5 C9 3C Fø BD ØFC9:15 C9 01 FØ 03 4C AC ØF C5 ØFD1:A5 C5 C9 61 Dø FA \(2 \emptyset\) C3 F3 ØFD9:FF 2ø CC FF 6ø 24 A5 C5 3E ØFE1:C9 3C FØ FA 4C AC ØF Aø 95 ØFE9:ØØ A9 \(2 \varnothing 99\) Dø \(\varnothing 6\) C8 Dø 11 ØFF1:FA 4C Ø5 ØE ØØ ØØ ØØ ØØ 22

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\title{
ML Relocator
}

\author{
Samuel Ford
}

Here's a solution to a common prob-lem-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:

\section*{1øø PRINT"FILENAME":INPUT FS \\ 110 OPEN 2,8,2,"Ø:"+F\$+",P,R" \\ \(12 \varnothing\) GET \#2,LOS:GET \#2,HIS \\ \(130 \mathrm{ADR}=(\operatorname{ASC}(\mathrm{LO} \$+\operatorname{CHR} \$(\varnothing))+\) \{SPACE \(256 *\) ASC (HI \$+CHR \(\$\) (ø))) \\ \(14 \varnothing\) PRINT"STARTING ADDRESS"; AD R \\ 150 PRINT"CALCULATING SIZE..." \(16 \varnothing\) GET \#2, X\$: IF ST= \(\quad\) THEN ADR =ADR+1:GOTO 160 \\ \(17 \varnothing\) 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 \(\$ \mathrm{C} 000\) 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.

\section*{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.

\section*{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:
\begin{tabular}{ll} 
LDA & \(\# \$ 00\) \\
STA & \(\$ F D\) \\
LDA & \(\# \$ C 1\) \\
STA & \$FE \\
LDA & \(\# \$ 41\) \\
LDY & \(\# \$ 00\) \\
STA & (\$FD),Y
\end{tabular}

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 "COMPUTEI's Guide to Typing In Programs" elsewhere in this issue.

\section*{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 1øøø: NEXT
MA \(2 \emptyset\) DIM \(C D(255), T B(20,1)\)
DC \(3 \emptyset\) PRINT" \(\{D O W N\}\) SETTING UP.. .";:FOR A=ø TO 255:READ \{SPACE\}CD (A): NEXT: PRINT" DONE"
AB \(4 \varnothing\) INPUT"\{DOWN\} SOURCE: STAR T,END"; CS\$,CES
AP \(41 \mathrm{~N} \$=C S \$: G O S U B\) 50ø:CS=N GE \(42 \mathrm{~N} \$=\mathrm{CE}\) : \(\mathrm{GOSUB} 500: \mathrm{CE}=\mathrm{N}\)

JG \(5 \emptyset\) INPUT"TARGET: \(\{5\) SPACES \(\}\) S TART"; TS
GS \(51 \mathrm{~N} \$=\mathrm{TS} \$:\) GOSUB \(5 \emptyset 0: T S=\mathrm{N}\)
FS \(6 \emptyset\) NT=ø:PRINT" \(\{\) DOWN \}ENTER S ECTIONS OF MEMORY TO SKI P, \(\{7\) SPACES \(\}\) END WITH COM MA \{DOWN \}"
CJ \(7 \varnothing\) PRINT"TABLE"NT+1; : INPUT \{SPACE\}AS,B\$
SS 72 IF A\$="" THEN 1øø
JX 74 IF \(B \$=" "\) THEN \(B \$=A \$\)
SS \(76 \mathrm{~N} \$=A \$: G O S U B\) 5øø: \(A=N: N \$=B\) \$: GOSUB 5øø:B=N
RQ 8 Ø IF \(B=\varnothing\) THEN \(B=A\)
JQ 85 IF \(A<C S\) OR \(A>C E\) OR \(B<C S\) \{SPACE\}OR \(B>C E\) OR \(B<A\) TH EN \(7 \varnothing\)
FS \(9 \varnothing \mathrm{NT}=\mathrm{NT}+1: \mathrm{TB}(\mathrm{NT}, \varnothing)=\mathrm{A}: \mathrm{TB}(\mathrm{NT}\) ,1)=B:GOTO \(7 \emptyset\)
KH 1øø PRINT"\{DOWN\}WORKING . . ."
\(B C 11 \emptyset\) IF NT \(<2\) THEN \(12 \emptyset\)
JP 112 FOR \(A=N T\) TO 2 STEP-1:FO R \(B=1\) TO \(A-1\)
MJ \(114 \mathrm{IF} \mathrm{TB}(\mathrm{A}, \varnothing)<\mathrm{TB}(\mathrm{B}, \varnothing)\) THEN \(T=T B(A, \varnothing): T B(A, \varnothing)=T B(B\) \(, \varnothing): T B(B, \varnothing)=T\)
CP 116 NEXT B,A
JQ \(12 \emptyset \mathrm{TP}=\varnothing: \mathrm{PT}=\mathrm{CS}: \mathrm{OF}=\mathrm{TS}-\mathrm{CS}\)
XH \(13 \emptyset\) IF NT=TP THEN \(14 \emptyset\)
PS \(135 \mathrm{Zl}=\mathrm{TP}+1: I F \quad \mathrm{PT} \Rightarrow \mathrm{TB}(\mathrm{Z} 1, \varnothing)\) AND PT \(<=T B(Z 1,1)\) THEN \(\{S P A C E\} P T=T B(Z 1,1)+1: T P\) \(=T P+1\)
PG \(14 \varnothing \mathrm{Zl}=\mathrm{CD}(\operatorname{PEEK}(\mathrm{PT})): I F \quad \mathrm{Zl}<2\) THEN 160
PH \(15 \emptyset \quad \mathrm{Z} 2=\operatorname{PEEK}(\mathrm{PT}+1)+\mathrm{PEEK}(\mathrm{PT}+2\) ) *256
RR 155 IFZ2=>CSANDZ2 \(<=\) CETHENZ2 \(=\mathrm{Z} 2+\mathrm{OF}: \mathrm{POKEPT}+2, \mathrm{Z} 2 / 255\) : POKEPT+1, Z2-INT (Z2/256) *256
\(\mathrm{XD} 16 \emptyset \mathrm{PT}=\mathrm{PT}+\mathrm{Z} 1+1: \mathrm{IF}\) PT \(<\mathrm{CE}\) THE N 130
SF \(17 \emptyset\) PRINT"\{DOWN\}FINISHED. " ;:
EB \(18 \emptyset\) INPUT "RELOCATE (Y/N)"; AS:IF AS<>"Y" AND AS<>" N" THEN \(18 \emptyset\)
PS \(19 \emptyset\) IF \(A S=" N "\) THEN END
KX 2øø PRINT"\{DOWN\}WORKING..." ;
AJ \(21 \varnothing\) IF TS>CS THEN FOR A=CE \{SPACE\}TO CS STEP -1:PO KE A+OF, \(\operatorname{PEEK}(\mathrm{A}): \operatorname{NEXT}\)
HD \(22 \emptyset\) IF TS \(<C S\) THEN FOR A=CS \{SPACE\}TO CE: POKE A+OF, PEEK (A) : NEXT
RH 230 PRINT"DONE": END
PQ \(5 \emptyset \emptyset \mathrm{~N} 1 \$=\mathrm{LEFT}(\mathrm{N} \$, 1): \mathrm{N} \$=\mathrm{MID} \$\) (N\$,2)
XX \(51 \varnothing\) IF N1 \$<>"\$" THEN N=VAL ( N1\$+N\$): RETURN
QF \(52 \emptyset \mathrm{~N}=\varnothing: \mathrm{FOR} \mathrm{N} 1=1\) TO \(4: \mathrm{N} 2=\mathrm{AS}\) \(\mathrm{C}(\operatorname{MID} \$(\mathrm{~N} \$, \mathrm{~N} 1,1))-55: \mathrm{N} 2=\) N2-7* (N2く1の)
CS \(53 \emptyset \mathrm{~N}=\mathrm{N}+\mathrm{N} 2 * 16 \uparrow(4-\mathrm{Nl}): \mathrm{NEXT}: \mathrm{R}\) ETURN
CS 1øøø DATA \(\varnothing, 1, \varnothing, \varnothing, 0,1,1, \varnothing, \varnothing\) \(, 1, \varnothing, \varnothing, \varnothing, 2,2, \varnothing, 1,1, \varnothing, \varnothing\) \(, \varnothing, 1,1, \varnothing, \varnothing, 2, \varnothing, \varnothing, \varnothing, 2,2\) , 0
QH \(1 \varnothing 1 \emptyset\) DATA \(2,1, \varnothing, \varnothing, 1,1,1, \varnothing, \varnothing\) \(, 1, \varnothing, \varnothing, 2,2,2, \varnothing, 1,1, \varnothing, \varnothing\) \(, \varnothing, 1,1, \varnothing, \varnothing, 2, \varnothing, \varnothing, \varnothing, 2,2\) , \(\varnothing\)
GE \(1 \varnothing 2 \emptyset\) DATA \(\varnothing, 1, \varnothing, \varnothing, \varnothing, 1,1, \varnothing, \varnothing\) \(, 1, \varnothing, \varnothing, 2,2,2, \varnothing, 1,1, \varnothing, \varnothing\) \(, \varnothing, 1,1, \varnothing, \varnothing, 2, \varnothing, \varnothing, \varnothing, 2,2\) , \(\varnothing\)
FH \(1 \emptyset 3 \varnothing\) DATA \(\varnothing, 1, \varnothing, \varnothing, \varnothing, 1,1, \varnothing, \varnothing\)```


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[^1]:    Name (Please print)

